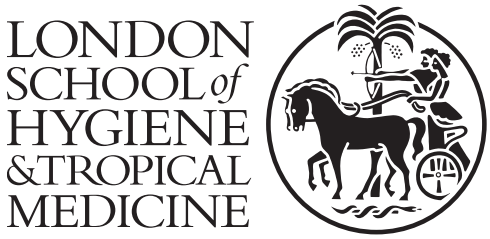

The epidemiology of, and risk factors for, oro-genital and anal human papillomavirus infections among sexually active Nigerians in Ibadan: a mixed methods study

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DECLARATION

I, Imran O. Morhason-Bello, confirm that the work presented in this thesis is my own.

Where information has been derived from others, I confirm that this has been indicated in the thesis.

 22/10/19

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ABSTRACT

Background: Human papillomavirus (HPV) is primarily transmitted by unprotected sexual behaviours, and persistence of this virus is associated with HPV-related cancers of the cervix, anus, vulvar, oral cavity and penis. Nigeria has one of the highest burdens of cervical cancer, but there is a paucity of data on other HPV-related cancers.

Research objectives: To describe the epidemiology of HPV and the pattern of genital, oral and anal sexual intercourse and their association with the prevalence of genital, oral and anal HPV infections among adolescents and young adults and female sex workers (FSWs) (18-45 years) in Nigeria.

Methods: First, a systematic review of reported oral and anal sex among heterosexual adolescents and adults in sub-Saharan Africa (SSA) was conducted. Second, a qualitative study that enrolled adolescent girls and young women in the community and in brothel-based FSW in Ibadan, Nigeria was conducted. The study used focus group discussions and in-depth interviews to collect data on definitions or meanings, attitudes and interpretations of different sexual behaviours. Third, a cross-sectional survey was conducted in Ibadan amongst girls and young women and FSWs to measure the prevalence and risk factors of oral, vulvar, cervical and anal HPV infections. Participants were interviewed, had a clinical examination and samples were collected for HPV genotyping. Blood samples were also collected for human immunodeficiency virus testing.

Results: The systematic review showed that oral and anal sex are commonly practiced in SSA, particularly among adolescents, young adults and FSWs. In the qualitative study, most participants had heard of oral and anal sex; more adolescents and FSWs had heard of these practices than adults. Local terminology/slang terms for oral and anal sex were acceptable to adolescents and FSWs but adults in the community often disapproved of these terms for framing interview questions. The most common motivations for practicing oral and anal sex were protection of sexual relationships and financial benefits. Concerns about these practices included fear of acquiring diseases and physical injury.

For the prevalence survey, 310 women, and 315 FSWs participated. Ever having practised oral sex was three times more frequently reported by FSWs than general population girls and women. Only one woman in the general population and eight FSWs had ever engaged in anal sex. The prevalences of any HPV genotypes were higher in FSWs than in general population

girls and women in the vulva (88% versus 69%), cervix (84% versus 60%), anal cavity (75% versus 57%) and oral cavity (24% versus 16%). The prevalence of HPV was significantly higher in adolescents and young adults than in adults in the cervix, vulvar and anal cavity in the two surveys. In the adjusted model, there were higher odds of cervical HPV infection among women with concomitant vulvar (Adjusted odds ratio (aOR)= 12.85, 95% CI, 5.70-28.99), oral (aOR= 4.37, 95% CI, 1.50-12.71) and anal (aOR=3.48, 95%CI, 1.74-6.96) HPV infection while women with concomitant cervical (aOR=22.19, 95 %CI 7.85-62.72) and anal (aOR=6.68, 95% CI 2.44-18.26) HPV infections had higher odds of vulvar HPV infection. The odds of having anal HPV infection was associated with history of concomitant cervical (aOR=4.10, 95% CI, 1.85-9.11) and vulvar (aOR=5.47, 95% CI, 2.11-14.20) HPV infection. Only the history of concomitant cervical HPV (aOR=4.81, 95% CI, 1.58-14.62) was associated with a higher odd of oral HPV. Among the FSWs, history of concomitant vulvar HPV infection was associated with higher odds of cervical (aOR=16.60, 95% CI, 5.08-47.54) and anal (aOR=10.55, 95% CI, 3.67-30.31 HPV infection, whereas history of concomitant cervical (aOR=6.48, 95% CI, 2.70-15.57) and anal (aOR=8.88, 95% CI, 3.66-23.28) HPV was associated with higher odds of vulvar HPV infections. The socio-demographic, behavioural and other biological factors that were associated with any HPV infections in specific anatomic sites are presented in the relevant chapters.

Conclusion: Adolescents and adults, including FSWs in Ibadan, frequently engaged in different sexual behaviours, which might predispose them to sexually transmitted infections. HPV infection was found to be common among sexually active girls and women, with a higher prevalence among FSWs.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ACASI	Audio computer assisted and face-to-face interview
AIDS	Acquired Immunodeficiency Diseases
CA	California
CASI	Computer assisted personal interviews
CE-IVD	Certified in Europe for in-vitro diagnostics
CIN	Cervical intraepithelial neoplasia
DNA	Deoxyribonucleic acid
EA	Enumeration area
FDA	Food and drug administration
FGD	Focus group discussion
FSW	Female sex worker
FTFI	Face-to-face interviews
GCP	Good clinical practice
GP	General Population
HIV	Human Immunodeficiency Virus
HPV	Human papillomavirus
HR-HPV	High-risk HPV
HSV	Herpes simplex virus
IARC	International Agency for Research on Cancer
ICC	Intra-cluster correlation coefficient
ICO	Catalan Institute of Oncology
IBBSS	Integrated Biological and Behavioural Surveillance Surveys
IDI	In-depth-interview
KAP	Key Affected Population
LGA	Local government areas
LR-HPV	Low-risk HPV
LSHTM	London School of Hygiene and Tropical Medicine
MOOSE	Meta-analysis of Observational Studies in Epidemiology
mRNA	Messenger ribonucleic acid
MSM	Men that have sex with men
MSW	Men who have sex with women
NA	Not applicable
NATSAL	National Survey of Sexual Attitudes and Lifestyles
PCR	Polymerase chain reaction
PI	Principal Investigator
PPS	Probability proportion to size

PRISMA	Preferred Items for Reporting of Systematic Reviews and Meta-analyses
RCT	Randomised Control Trial
RDT	Rapid diagnostic test
RNA	Riboxynucleic acid
SAQ	Self-administered questionnaires
SFH	Society for family health
SHINI	Sexual Behaviour and HPV Infection in Nigerians in Ibadan
SSA	Sub-Saharan Africa
STI	sexually transmitted infection
T-ACASI	Telephone-and computer-assisted interviews
TI	Telephone interviews with a human interviewer
TLFB	Timeline-follow back assessments
UI	University of Ibadan
UK	United Kingdom
USD	United State Dollars
VIA	Visual inspection with acetic acid
VILI	Visual inspection with Lugols Iodine
VIN	Vulvar intraepithelial neoplasia
WHO	World Health Organisation

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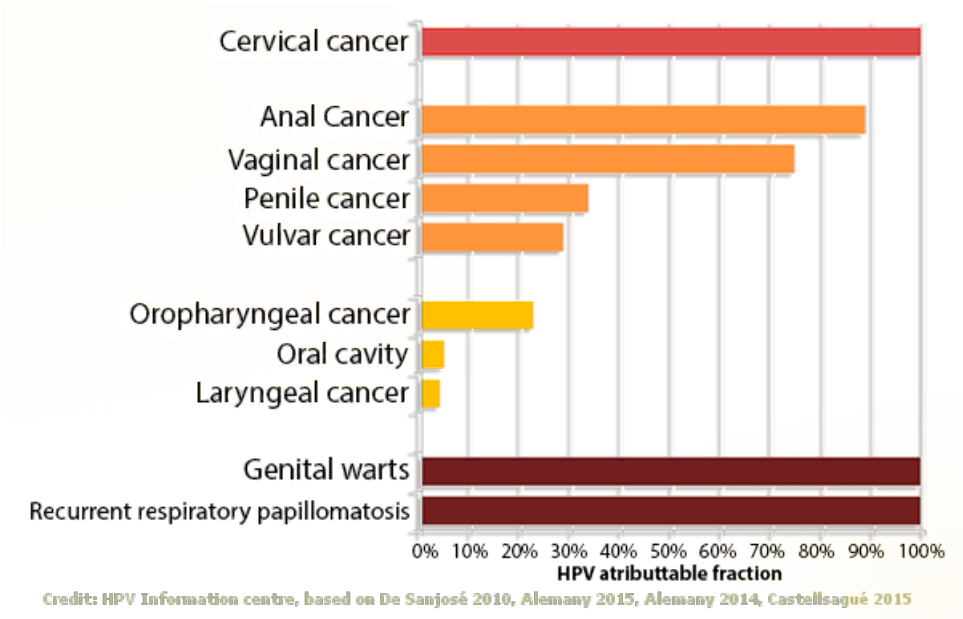
CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

Human papillomavirus (HPV) is a double stranded DNA virus from the alpha Papillomaviridae family. There are over 200 known genotypes of HPV, of which about 40 have a predilection for infecting epithelial and mucosa surfaces[1, 2] . The majority of HPV infections are asymptomatic and only a small proportion are associated with symptoms or disease, which can involve benign (verruca, warts and papillomas), premalignant or malignant lesions[1, 3]. Genital HPV infection is one of the most common sexually transmitted infections (STIs), and it can be transmitted through condomless vaginal, anal, and oral sexual intercourse [3, 4]. In addition, it is also transmitted through non-penetrative sexual behaviours and skin-to-skin contact[5].

Worldwide, HPV-associated cancers are estimated to account for 4.5% of all cancers, with the highest burden occurring in developing countries [6, 7]. Specifically, HPV infection is associated with 99.0% of cervical cancer, 88.0% of anal cancer, 70.0% of vaginal cancers, 50.0% of penile cancers, 43.0% of vulvar cancer and 25.6% of head and neck cancers (Figure 1) [7].

Figure 1.1: Global burden of HPV and HPV-related diseases *[7]*



Sub-Saharan Africa has the highest burden of HPV-related cancer worldwide. According to a 2019 HPV Information Centre report, the average age-standardised incidence rate of cervical

cancer per annum is highest in Africa (27.6/100,000 women/year) relative to other continents (10.2-11.9/100,000 women/year)[7]. Africa also has the highest average age-standardised cervical cancer associated mortality rate per annum of 20.0/100,000 women/year[7]. Countries in southern Africa have the highest average age-standardised incidence rate per annum of cervical cancer (43.1/100,000 women/year), followed by east African (40.1/100,000 women/year) and west African (29.6/100,000 women/year) countries globally[7]. However, the average age-standardised cervical cancer associated mortality rate per annum is highest in eastern Africa (30.0/100,000 women/year), followed by western Africa (23.0/100,000 women/year) and southern Africa (20.0/100,000 women/year)[7].

This chapter reviews the classification of HPV, natural history and pathogenesis of HPV, prevention and screening of HPV, epidemiology and risk factors of HPV, and present knowledge gaps. The rationale for studies in this thesis, the structure, aims and objectives of the thesis, the Nigerian context, and my role in the PhD are also described.

1.1. CLASSIFICATION OF HPV

The five evolutionary genera of HPV based on DNA sequence analysis are alpha, beta, gamma and Nu/Mu papillomaviruses. Of these, the largest group is the alpha HPV group [3, 4], which this thesis will focus on. HPV types are broadly classified into 'high-risk' (HR-HPV) or oncogenic and 'low-risk' or non-oncogenic types. The HR-HPV genotypes are associated with premalignant or malignant lesions while the low-risk (LR-HPV) genotypes are generally associated benign lesions like genital warts [8].

The International Agency for Research on Cancer (IARC) has classified HPV genotypes based on epidemiological evidence of cancer risks as follows: 'definitely carcinogenic to humans' (group 1: 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58 and 59); 'probably carcinogenic to humans' (group 2a: 68); 'possibly carcinogenic to humans' (group 2b: 26, 30, 34, 53, 55, 66, 67, 69, 70, 71, 72, 73, 81, 82, 83, 84, IS39 and CP6108); and 'not classifiable as to its carcinogenicity to humans' (group 3: 6, 11)[9].

Table 1.1. Broad classification of human papillomavirus by oncogenic risk and associated diseases according to the International Agency for Research on Cancer Education[4]

HUMAN PAPILLOMAVIRUS	GENOTYPES	ASSOCIATED DISEASE
HR-HPV or oncogenic	HPV 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59	Cervical, anal, vaginal vulvar, penile, and oropharyngeal cancer and associated precursor lesions
LR-HPV types	HPV 6, 11	Genital warts, recurrent respiratory papillomatosis
Probable carcinogenic	HPV 68	Cervical cancer
Possible carcinogenic	HPV 5, 8	Squamous cell carcinoma of the skin in patients affected by epidermodysplasia verruciformis
Possible carcinogenic	HPV 26, 30, 34, 53, 66, 67, 69, 70, 73, 82, 85 and 97	Uncertain

Table adapted from de Sanjosé et al 2018. The natural history of human papillomavirus infection. Best Practice & Research Clinical Obstetrics and Gynecology. 47:2-13

1.2. NATURAL HISTORY AND PATHOGENESIS OF HPV INFECTION

The highest incidence of HPV infection is around sexual debut and in young adults up to 30 years of age. Thereafter, the risk generally declines with age [3, 4, 10, 11]. Some of the biological theories proposed for the high-risk of acquiring HPV infection among adolescents around their sexual debut include immaturity of the cervix including exposure of the columnar epithelium (ectopy) and insufficient production of cervical mucus within this age group [12, 13]. Acquisition of new HPV infections is associated with the following factors: multiple sexual partners, acquisition of new sexual partners, presence of other STIs, marital status, male circumcision, condom use, immunosuppression, hormone contraceptives, use of drugs, smoking, alcohol consumption and dietary deficiency, amongst others [4, 10, 14].

The pathogenesis of HPV infection involves incorporation of the viral particles into the host genome in the basal cell layer following disruption of epithelial or mucosa lining of ecto-

endocervix or anorectal junctions [4, 15]. After viral incorporation, the oncoproteins E6 and E7 are expressed; both prevent cell apoptosis through inhibition of tumour suppressor genes (p53 and retinoblastoma (rb) genes)[1, 16]. This results in amplification of viral replication and uncontrolled division of infected cells[16]. Normally, the immune system prevents amplification and subsequent progression of HPV infection at the infected anatomic site[1]. If an HPV infection escapes host immune control, it can persist, causing dysplastic cellular changes of the infected basal cells [17].

In the cervix, HPV infection occurs in the transformation zone – this is a junction between the columnar and squamous cell lining of the cervix and it is susceptible to dysplastic changes[18]. The squamocolumnar junction changes over the lifetime of a woman, and it depends on hormone status, oral contraceptive use, genital trauma and pregnancy[18]. A persistent HPV infection may progress from basal cell layer to other cellular layers of the epithelial lining causing low, medium or high grade premalignant lesions[5]. HR-HPV infection can progress from low to high-grade lesions whereas LR-HPV infection is generally associated with low grade lesions [3-5]. Cervical premalignant lesions, also known as cervical intraepithelial lesions (CIN) on histology, are classified into CIN 1, CIN 2 and CIN 3 based on the degree of cellular dysplasia of the epithelial lining [19]. CIN 1 refers to dysplasia that is confined to the basal one-third of the epithelial lining; CIN 2 is dysplasia that involves the basal two-thirds of the epithelial lining and CIN 3 is degree of dysplasia in more than two-thirds of the epithelium[19]. The time interval for developing these lesions from the point of HR-HPV acquisition can depend on other co-factors such as immunosuppression, other co-morbidities (e.g. HIV and STIs) and smoking, pregnancy, viral load, type of HR-HPV infection and age [5, 20].

Each CIN stage can regress to earlier stages and to normal epithelium. The average probability of regression to normal epithelium is 55.0-57.0% for CIN 1, 43.0-62.4% for CIN 2 and 17.4-32.0% for CIN 3 [20, 21]. Progression of untreated cervical premalignant lesions to invasive cancer is less than 1% for CIN 1, 1.5% for CIN 2 and 12% for CIN 3 [21, 22]. In 2018, a study in USA among 783 women with diagnosis of CIN 1, 2 and 3 reported higher rate of regression and remission, and lower rate of progression of premalignant lesions among young patients than older patients [20]. In the same study, a pooled estimate of a meta-analysis of seven studies that involved 3705 women was performed [20]. The result showed a similar outcome

of higher rates of regression among women that were less than 25 years (58.4%) compared with those that were 35 years and above (46.2%)[20].

In general, 80.0-90.0% of HPV infections (infections with a specific genotype) are cleared by the immune system [5, 23]. In healthy individuals, the majority of new cervical infections are cleared within a year and about 90.0% will resolve within 2 years [23]. Anal, vulvar and vaginal HPV infections appear to have similar rates of clearance to that of the cervical infections [23]. For example, a study in USA among 1568 heterosexual young women (13-21years) showed that the majority cleared anal HPV infections by the third year of detectable infection [24]. The authors suggested that the slow clearance rate might be due to viral shedding from other nearby infected anatomic sites such as the cervix or the vagina [24]. The clearance rate in the oral cavity is reported to be faster than cervical and other anogenital sites [25, 26]. Some studies have associated high clearance rates of HPV infection in the cervix, vulvar and oral cavity with women who are young [4, 27]. However, a few studies found no difference in clearance rates by age among people with anal HPV infection [24, 28].

The clearance of incident HPV infections is mediated by adaptive immunity in healthy individuals [17, 29]. T-cell mediated immune responses prevent further viral division and expression of oncoproteins[30] . An individual who clears a specific HPV infection is presumed to no longer be infected with that genotype. However, there is emerging evidence that clearance as defined by detection of a specific HPV genotype and then non-detection of that genotype at a subsequent visit may not represent complete clearance of that specific HPV infection [17, 29]. Asymptomatic HPV infection may be present as low viral copies that cannot be detected [17, 29]. It is therefore plausible that a proportion of HPV infections defined as cleared may be in a latency phase [17, 29, 31]. For example, animal molecular model studies with cottontail rabbit papillomavirus and rabbit oral papillomavirus models showed that HPV infection could remain latent without evidence of clinical infection [29, 32].

Similarly, latent HPV infection has been reported in subjects with normal laryngeal epithelia who are in remission from recurrent respiratory papillomatosis [29, 33]. Reactivation of HPV infections has been found to occur with immunosuppression such as HIV infection, steroid use, pregnancy, ultraviolent light and mechanical stimulation [4, 17, 29, 34]. As mentioned above, HPV infections may escape the body's immune response and can become persistent

[35]. Persistent HPV infection is the cause of anogenital warts, respiratory papillomatosis, and cervical cancer, and it also causes some anal, vulva, penile and oropharyngeal cancers [6, 36, 37]. The persistence of HR-HPV genotypes can result in premalignant and malignant lesions over 10-20 years [4, 38]. There is no uniform operational definition of persistent infection; some studies defined this as the presence of the same genotype of HPV 12 months after the first detection or two visits of 6 months apart after the first detection [4, 24, 39-42]. A repeat HPV test at 12 months is recommended for those who have previously been HPV positive with negative cervical cytology as a screening guideline [4]. It is unclear whether persistence is due to reinfection of the same genotype after clearance or reactivation of a latent subclinical infection or continuous detection of the same type [29, 43]. Some of the factors associated with persistence of HPV infection in epidemiological studies are immunosuppression, smoking, hormonal contraceptives and the presence of other STIs [6, 7].

Generally, most of the natural history-related information relates to the cervical HPV infection but there is emerging evidence that suggests that anal, vulvar, vaginal, and oral HPV infections might have similar oncogenic potentials as cervical HPV infections [4, 6, 44-46]. HR-HPV infections of anogenital sites and oral cavities in men and women may persist and undergo malignant transformation. However, there are still some unanswered questions pertaining to HPV acquisition, clearance and persistence at these non-cervical sites [44]. Of all the HPV types, HPV 16 has the strongest association with HPV-related cancers [1, 10]. In non-cervical sites, similar types and strains of HPV have been isolated, and HPV 16 remains the most likely to cause cancer [3, 47]. However, some LR-HPV types have been associated with some penile cancers [3, 48].

1.3. PREVENTION AND SCREENING OF HPV INFECTION AND RELATED DISEASES

1.3.1. Primary prevention with HPV vaccination

There are three licensed prophylactic HPV vaccines: Cervarix® (GlaxoSmithKline Biologicals, Rixensart, Belgium) protects against HPV 16 and 18; Gardasil® (Merck and Co, Inc., Whitehouse Station, NJ, USA) protects against HPV 6, 11, 16 and 18, and Gardasil®9 (Merck and Co, Inc., Whitehouse Station, NJ, USA) protects against HPV 6, 11, 16, 18, 31, 33, 45, 52 and 58. These vaccines have been approved by the US Food and Drug Administration (FDA)

to primarily prevent HPV infections in boys and girls [2]. Routine HPV vaccine is part of the global strategy to eliminate cervical cancer[49] [50]. The maximum benefit of HPV vaccination is attained when it is administered before sexual debut and exposure to HPV infection.

Table 1.2: Characteristics of the three licensed HPV vaccines [51]

VARIABLE	GARDASIL®	CERVARIX®	GARDASIL®9
Manufacturer	Merck and Co, Inc., Whitehouse Station, NJ, USA	GlaxoSmithKline Biologicals, Rixensart, Belgium	Merck and Co, Inc., Whitehouse Station, NJ, USA
Full name	Human papillomavirus Quadrivalent Vaccine, Recombinant	Human papillomavirus Bivalent Vaccine, Recombinant	Human Papillomavirus 9-valent Vaccine, Recombinant
HPV genotypes	6, 11, 16 and 18	16 and 18	6, 11, 16, 18, 31, 33, 45, 52 and 58
FDA approval date	2006	2008	2014
Recommended dose	2	2	3
Recommended dosing schedule	0, 6-12 months	0, 6-12 months	0, 1-2, 6 months
Prevention benefits	Mostly cervical cancer and warts	Mostly cervical cancer	Cervical, vulvar, vaginal, and anal cancers, and warts

Adapted from the Centers for Disease Control, USA (https://www.cdc.gov/hpv/hcp/schedules-recommendations.html)

The 2030 target resolution established at the 2018 World Health Assembly was for the member countries to achieve a national coverage of 90.0% of two doses of HPV vaccination for girls aged 15 years[50]. However, a global HPV vaccine coverage review (2014-2016) of 51 countries showed that 27.0% of those with 80.0% coverage were from high-income countries, and another 25.0% of countries that had introduced HPV vaccination had less than 50.0% coverage[52]. Out of seven African countries that have introduced national HPV vaccination programme, only two countries (Rwanda and Seychelles) had 90.0% national HPV vaccine coverage[52]. There is also increasing demand for a gender-neutral HPV vaccination in high income countries [53-55], which advocates for equitable access to HPV vaccine coverage through the inclusion of boys. Some researchers believe that a gender-neutral vaccine coverage policy will speed up herd immunity, reduce the burden of HPV-related diseases in men and women, and possibly eliminate transmission of HPV infection [53, 54]. Other

researchers believe that HPV vaccination of girls only is cost efficient and may also protect boys from the infection[56].

1.3.2. Screening for premalignant lesions

Cytological screening for premalignant lesions along with treatment of detected lesions is an effective secondary prevention intervention for cancer of the cervix as it significantly reduces disease incidence and associated mortality [23, 57]. According to the 2019 HPV Information Centre report, implementation of population level cytological screening (using Papanicolaou (Pap) smears) for sexually active women is available in Europe, North America, most of Oceania and Asian countries, and a few countries in Africa, as part of their national cervical cancer screening programmes [7]. According to the same report, a large number of other countries in Asia and Africa still engage in opportunistic Pap smear screening for eligible women[7]. The Pap smear screening test has a high specificity (96.0–100%) and low to moderate sensitivity (40.0-60.0%) for detection of premalignant lesions (CIN 2 and CIN 3) [57-60].

Though cytological screening for premalignant lesions of anal and vulvar regions could also reasonably predict the respective cancers risks at these sites, the cost effectiveness of this approach at the population level is unclear [61-63]. Key affected populations such as men that have sex with men (MSM) and women that engage in anal sex are offered anal Pap screening as part of STI screening guidelines by some health organisations in the USA, Europe and Australia [64]. The sensitivity of anal Pap smear to detect premalignant anal lesions among MSM is 47.0-70.0%, and it increases when anal Pap smears are complemented with HPV genotyping and serial anoscopy [64, 65]. Presently there is no acceptable screening strategy for oral cancer.

Visual inspection with acetic acid (VIA), visual inspection with Lugols iodine (VILI) and HPV testing have been recommended by the World Health Organisation (WHO) as alternative cervical cancer screening methods to Pap smears for developing countries [66]. These methods are relatively cheap and are easier to interpret than Pap smears. VIA and VILI are used as part of the “screen-and-treat” treatment strategy for premalignant lesions [66]. Both methods have high sensitivity but lower specificity compared to the Pap smear[66].

1.3.3. HPV DNA detection for clinical use

HPV DNA detection methods are used for clinical and research purposes. Molecular techniques using nucleic probe technology are the only feasible methods to detect HPV [67, 68]. HPV DNA detection offers more information on persistence and clearance of infections and allows for monitoring of women with abnormal cytology who have negative colposcopy/biopsy findings [67, 68]. Therefore, HPV screening is useful for clinical decision-making and follow-up of patients, as well as for clinical research and epidemiological studies[67]. In 2017, a systematic review on cost-effectiveness of cervical cancer screening methods in low and middle-income countries showed that HPV testing is more cost efficient than VIA and Pap smear screening [69].

Broadly, there are three molecular techniques for detecting HPV: nucleic acid hybridization assays; signal amplification assays; and nucleic-acid amplification assays [23, 67, 68]. Nucleic acid hybridization methods include Southern blot, in-situ hybridization and Dot blot hybridization. Although nucleic acid hybridization provides good quality results, it is technically cumbersome, time-consuming and requires a large amount of purified nucleic acid for HPV genome analysis [67, 68]. These issues coupled with low sensitivity make it less attractive as a screening method to detect premalignant lesions.

The signal amplification assays are automated methods that can distinguish between high and low risk genotypes, but they cannot distinguish between or provide results for individual HPV genotypes [67, 68, 70]. These techniques serve as a complementary screening method to Pap smear or VIA/VILI to detect HR-HPV infections associated with premalignant and malignant lesions of the cervix as a point of care diagnostic method [71]. Examples of commercial signal amplification assays include Hybrid Capture® 2 (Qiagen Corporation, Gaithersburg, MD, USA) and Cervista® HPV (Hologic, Inc., Bedford, MA, USA) [71]. Signal amplification assays have higher sensitivity and lower false positive results compared with other molecular techniques. Hybrid Capture 2 is recommended for detection of oncogenic HPV infections in genital and non-genital sites [71]. The Care HPV test kit (QIAGEN, Gaithersburg, MD) is a simplified and rapid technology of the Hybrid Capture kit that has been shown to be very efficient as a point of

care test in many low-middle income countries including in Africa [72-74]. Other point of care screening tests for HPV detection include OncoE6 and Xpert HPV test (GeneXpert; Cepheid,

Sunnyvale, CA) assays [68]. Both Care HPV and Xpert HPV tests can detect 14 high-risk HPV genotypes [75-77].

1.3.4. HPV DNA detection for research use

The nucleic acid amplification assays use polymerase chain reaction (PCR)-based techniques. These are highly sensitive and specific, can detect individual genotype specific result within a sample and have the lowest risk of contamination [67, 68]. These PCR-based techniques are generally used for research purposes and can be expensive for population screening programmes. There are various modifications of the conventional PCR technique to improve the quality of genotyping, reduce turnaround time and minimize errors[68]. Some of the examples of PCR based techniques include real-time PCR, Abbott real-time PCR, COBAS® 4800 HPV test (Roche Molecular Systems, Pleasanton, CA, USA), CLARTW Human Papillomavirus 2 (Genomica, Madrid, Spain), PapilloCheck®, Anyplex™ II HPV28 assay (Seegene, Seoul, South Korea) and the Linear Array® HPV Genotyping assay (Roche Molecular Diagnostics, Pleasanton, CA, USA)[68]. These techniques vary in the number of individual genotypes they can detect. For example, the PapilloCheck® assay detects 24 HPV genotypes while the Roche Linear Array® assay detects 37 HPV genotypes in a single reaction [68, 78].

More novel techniques are being developed that can identify the virus and are able to determine biomarkers of progression of HPV infection at any anatomic site [67, 68]. These techniques involve detection of HPV mRNA and E6/E7 onco-proteins; the biomarkers for persistence of HPV infection. However, many of these techniques are still undergoing validation [67, 68].

1.4. EPIDEMIOLOGY OF HPV INFECTION

1.4.1. Prevalence of HPV infection and associated risk factors

Prevalence of Cervical HPV Infection

The WHO estimated that approximately 291 million women are infected with HPV at any given point in time [66]. According to the 2019 HPV Information Centre report, the range of the global prevalence of cervical HPV infection was 6.3-29.7% in cytologically normal women with variations across continents; the highest estimates ranged between 20.6-37.3% in sub-Saharan Africa and the Americas[7]. In the same report, cervical HPV prevalence was highest among women that were less than 25 years and it declined with age except in Africa, Asia and Oceania, which have a second peak prevalence among women that are 50 years and above[7].

In the last five years (2014-2019), there were more published articles on the prevalence of cervical HPV among healthy populations from Asia [79-85] and South America [86-89] than other continents. The continent with the fewest published articles was Africa [90, 91] [Table 1]. Most studies reported prevalence of any HPV infections alone in the cervix while others included prevalence of HR, type specific genotypes and multiple HPV infections in their results [85, 92]. Generally, prevalence of cervical HPV infection among the general population has not changed markedly in the last decade. A study from South America reported an unusually high prevalence of 74.0% among indigenous women in the northern part of the Venezuelan Amazonas State [86]. The unusual high prevalence was thought to be due to high burden of anaemia and intestinal helminthiasis in the population, which could potentially reduce clearance of HPV infection [86].

Generally, a high prevalence of cervical HPV infection was more commonly reported among female sex workers (FSWs) and other high-risk women than amongst women in the general population [93-96]. FSWs engage in multiple sexual partnerships, condomless sex, and intravaginal cleaning practices before or after sexual acts [93, 97-99]. All of these behaviours increase the risk of contracting STIs, including HIV and HPV infections.

Prevalence of Oral HPV Infection

The reported prevalence of oral HPV infection ranges from 0-20.7% in women among healthy populations worldwide [26, 100-107]; however, data for oral HPV in sub-Saharan Africa (SSA) are few. According to a systematic review published in 2018 on the prevalence of oral HPV among healthy populations of men and women, only five out of the 63 studies reviewed were from South Africa [26]. In this review, the average global prevalence of oral HPV was 7.7% (95%CI 6.8-8.6) with variations across the continents; the reported prevalences were higher in South America (12.4%), Europe (9.9%) and North America (7.7%) than Africa (7.0%), Oceania (4.6%) and Asia (2.6%). The reported average prevalence of oral HPV was higher in men (9.3%) than women (5.5%), and HPV 16 was the most prevalent genotype [26]. The observed gender difference in the reported prevalence of oral HPV might be due to a higher prevalence of multiple sexual partnerships in men, or because cunnilingus transmits HPV infection to the oral cavity more efficiently than fellatio [108-110]. FSWs and women who engaged in illicit drug use also had higher a prevalence of oral HPV infection compared with women in the general population [26, 105].

Other risk factors associated with oral HPV infection apart from oral sex include being HIV positive, HPV infection at other sites, having partners with abnormal cervical cytology or cancer, age at sexual initiation and alcohol consumption [111]. A few studies found a higher prevalence of oral HPV infection in heterosexual men than in homosexual men [112]. The plausible explanation is the increased risk of oral HPV infection from genital mucosa of a female partner compared to the keratinised skin surfaces of the penile shaft [113, 114].

Prevalence of Anal HPV Infection

There are more studies on anal HPV infections among MSM in high-income countries than among heterosexual men and women. In 2019, a systematic review of 1805 HIV-negative men who have sex with women (MSW), 924 HIV-positive MSW, 8213 HIV-negative MSM and 12758 HIV-positive MSM reported an average prevalence of any anal HPV of 47.0% in HIV-negative MSM and 12.0% in MSW[115]. Similarly, anal HPV infection was 79.0% and 43.0% in HIV-positive MSM and MSW, respectively [115]. In the same review, higher proportions of MSM had anal HPV 16 infections than the MSW population [115]. In another systematic review (2015), the prevalence of HR anal HPV infection was 4.0-22.0% among HIV negative women with no other HPV related pathology and 23.0-36.0% in those with HPV-related pathology of cervix, vulva and vagina [116].

Most studies that reported on the prevalence of anal HPV infection in SSA were conducted among MSM [117-119]. The prevalence of anal HPV ranged from 40.6-91.1% among MSM with a higher prevalence among those with HIV infection relative to the HIV negative population of MSM [118, 120, 121]. However, there is a paucity of data on the prevalence of anal HPV infection among healthy heterosexual men and women in SSA. Two Zimbabwean studies separately reported a prevalence of 44.0% [122] and 48.0% [123] of anal HPV infection among HIV positive and negative women respectively. A South African study found that 79.0% of HIV positive men had anal HPV and about a third of them had multiple HPV genotypes [124].

Available data on gender differences of anal HPV infections showed mixed results. A number of studies found a higher prevalence of anal HPV infection in women than men, and this has been associated with receptive anal sex by women and possibly as result of viral shedding from other HPV infected genital sites [122, 125]. A Zimbabwean study showed that 60.3% of

women and 20.4% of men had anal HPV infections in a cohort of people living with HIV in the community [122]. Another study from Brazil found that 71.3% of men and 67.1% of women had an anal HPV infection [125]. Some risk factors associated with acquisition of anal HPV infections include history of anal sex including digito-anal contact, a high number of lifetime anal sex acts, the presence of HPV in other genital sites, early sexual initiation, use of barrier methods and immunosuppression [125-127]. Detection of multiple anal HPV genotypes was also associated with having a high number of sexual partners [115]. However, the presence of a CD4 count in excess of 500 in HIV positive women is protective against multiple anal HPV infection [128].

Prevalence of Vulvar HPV Infection

Although several studies have linked HPV infection with vulvar intraepithelial neoplasia (VIN) and vulvar cancer, the data on the prevalence of vulvar HPV infections among healthy populations of women are limited worldwide [7, 129, 130]. A study demonstrated that vulvar samples can produce good quality HPV DNA for easy detection [131]. For example, a study in the USA compared HPV detection rates from the vulvar and cervical samples in women referred for colposcopy [131]. The results showed similar pick-up rates between vulvar and cervical samples for any HPV (82.4% vs 87.5%) and at least one oncogenic HPV genotype (72.1% vs 73.6%)[131]. Another study that used residual vulvar-vaginal swab samples of adolescents and young adults that were recruited for the National Chlamydia Screening Programme or Prevention of Pelvic Infection trial in the UK to investigate the prevalence of HPV at vulvar-vaginal site [132]. The prevalence of HR-HPV in the vulvar-vaginal samples was higher in participants aged 16-24 years (34.6%) than in 13-15year old adolescents (22.6%). In the same study, the prevalence of HPV 16 and 18 increased by age from 20.0% in 14 years to a peak of 39.0% at 19 years[132].

A Chinese study among 2,327 women (18-55 years) showed that the prevalence of any vulvar HPV, HR-HPV and LR-HPV were 13.3%, 12.8% and 0.8%, respectively [133]. HPV 52 was the most common genotype detected (4.4%). In this same study, women living in urban settings who had a high number of lifetime sexual partners in the past year, or who had ever used a towel supplied by a hotel had a higher odd of having a vulvar HPV infection than those without using towel [133].

Penile HPV Infection

Most studies reporting the prevalence of penile HPV infections were conducted among MSM, and they were largely from high-income countries [7, 134-136]. A meta-analysis of penile HPV infection involving 14,800 participants from 23 countries reported a wide range of prevalence figures from 1.0-84.0% and 2.0-93.0% among LR and HR men, respectively [136]. Another meta-analysis in 2018 that included 18,106 participants from studies that were published in English and Spanish language reported a prevalence range of 35.0-64.0% for any HPV and 26.0-45.0% for HR-HPV[135].

In SSA, a systematic review involving 9342 men reported an average pooled prevalence of penile HPV infection of 78.2% among HIV positive and 49.4% among HIV negative men [137]. The most common HR-HPV genotypes were 16, 52 and 58. Similar to other reviews, there were higher odds of penile HPV infections among uncircumcised men than among circumcised men [134, 138]. The biological explanation for the increased risk of HPV infection among uncircumcised participants is the high likelihood of HPV acquisition through the moist mucosa underneath the prepuce compared with acquisition through the keratinised scar of the circumcised area [136, 137]. A higher prevalence of HPV infections was reported among MSMs compared to heterosexual men, younger compared to older populations, men with higher numbers of lifetime sexual partners, men who engaged in inconsistent condom use, men who reported bathing less frequently and men engaging in illicit substance use [135] [138]. Some studies have also shown that the prevalence of penile HPV infection can also be associated with the method of sample collection [139, 140]. Collection of samples from the penile shaft, coronal sulcus and glans provides a better yield of DNA and prevalence of HPV than samples collected from the penile urethral meatus alone[139].

Table 1.3: Prevalence of cervical HPV among women *[2015-2019]*

AUTHORS	YEAR DATA WAS COLLECTED	CONTINENT/ COUNTRY	STUDY DESIGN	HPV DETECTION METHODS	AGE (Range) years	STUDY POPULATION	SAMPLE SIZE N	PREVALENCE (%)
Wolday 2018	2008-2009	AFRICA [Ethiopia]	Cross-sectional	PCR	≥40	Women in the clinic	141	48.9
Fowotade 2018	NS	AFRICA [Nigeria]	Cross-sectional	Serology (IgG & IgM)		Volunteer women in the clinic	90	20.0[1]
Nejo 2018	2014-2015	AFRICA [Nigeria]	Cross-sectional	PCR	≥15	Women in the community	295	18.6[1]
Okunade 2017	NS	AFRICA [Nigeria]	Cross-sectional	PCR	20-63	Women in the community/clinic	200	36.5[2]
Ardhaoul 2016	2012-2013	AFRICA [Tunisia]	Cross-sectional	PCR	18-65	Women in the community/clinic	325	13.2[1] 3.1[2]
Yuan 2019	2019	ASIA [China]	Hospital records	GenoArray kit	21-29	Women with normal cytology	9945	13.5[1]
Liu 2019	2013-2016	ASIA [China]	Hospital records	Linked Biotech HPV kit	≥15	Women attending gynaecology clinic	19700	16.3[1]
Ge 2019	2016-2017	ASIA [China]	Cross-sectional	Tellgenplex™ HPV DNA Test	16-85	Women in the community/clinic	65,613	15.5[1] 14.0[2]
Thapa 2018	2011	ASIA [India]	Cross-sectional	PCR	≥15	Women in the community/clinic	998	19.7[1] 11.7[2]
Bhattachanya 2018		ASIA [India]	Cross-sectional	PCR		Women in the community/clinic	629	36.1[1] 25.4[2]
Sainei 2018	2016-2017	ASIA [Malaysia]	Cross-sectional	PCR	18-70	Volunteer healthy women in the community/clinic	240	9.6[1] 4.2[2]
Mirbahari 2018	2015-2017	ASIA [Iran]	Cross-sectional	PCR	16-72	Women in the community	435	34.5[1] 19.5[2]
Aziz 2018	2014-2016	ASIA [Pakistan]	Cross-sectional	PCR	18-82	Women in the community/clinic	1011	4.8[1]
Zhong 2018	2010-2015	ASIA [China]	Cross-sectional	PCR	16-77	Women in the community/clinic	71,435	22.5[1] 12.3[2]
Gustavsson 2019[3]	2013-2015	EUROPE [Sweden]	Randomised control trial	PCR-based assay HpVIR	≥50	Women in the community	19,523 [7459]	4.1-4.6[1]
Seneldir 2019	2013-2015	EUROPE [Turkey]	Hospital records	Cervista HPV HR & HPV 16/18	18-75	Women with normal cytology	922	18.7[2]

Kovachev 2018	2012-2016	EUROPE [Bulgaria]	Cross-sectional	PCR – GenoFlow HPV Array	15-55	Volunteer women in the community	5277	29.8[1]
Bretagne 2018	2008-2017	EUROPE [France]	Cross-sectional	Hybrid Capture®		Volunteer women in the clinic	64	25.0[1]
Navarro-vidal 2018	2014-2015	NORTH AMERICA [Mexico]	Cross-sectional	PCR (ABI 3500)	20-70	Women in the community	1187	15.8[1] 14.7[2]
Lee 2018	2014-2015	NORTH AMERICA [USA]	Cross-sectional	PCR	21-65	Women in the community[AMI]	730	34.8[2]
Dickson 2015	2004-2011	NORTH AMERICA [USA]	Cross-sectional [hospital record]	PCR	21-30[4] 31-65[5]	Women in the community/clinic	220,914	47.3[4] 16.5[5]
Vargas-Robles 2018	NS	SOUTH AMERICA [Venezuela]	Cross-sectional	SPF 10 PCR LiPA25	12-53	Women in the community/clinic	228	74.0[1]
Teixeira 2018	2014-2015	SOUTH AMERICA [Brazil]	Cross-sectional	BD Onclarity™ HPV Assay	≥18	Women living with HIV in the community/clinic	325	31.1[2]
Ponce-Benavente 2018	2017	SOUTH AMERICA [Peru]	Cross-sectional	PCR	≥18	Volunteer healthy women in the community/clinic	397	63.6[2]
Vergara 2017	2014-2016	SOUTH AMERICA [Chile]	Cross-sectional	PCR	18-64	Women in the community/clinic	3160	10.8[1] 9.2[2]

***1**- overall/any HPV prevalence; **2** – any HR-HPV; **3** - information on HPV prevalence by methods of sample collection; NS – Not stated; PCR – Polymerase Chain Reaction; 4 – 21-30 years; 5 – 31-65years*

Table 1.4: Prevalence of Oral HPV in men and women [2015-2019]

AUTHORS	YEAR DATA WAS COLLECTED	CONTINENT/ COUNTRY	STUDY DESIGN	HPV DETECTION METHODS	AGE (Range) years	STUDY POPULATION	SAMPLE SIZE N	PREVALENCE (%)
Tam et al 2018	1995-2017	Global data	Systematic review	PCR	NS	Men and women	56,600	M: 9.3[1] F: 5.5[1]
Shigeishi 2016	2012-2015	Global	Systematic review	20 studies PCR & 9 studies used qualitative methods	NS	Men and women in the community/clinic	M:10,124 F:12,623	5.5[1]
Chikandiwa 2018[3,4]	2012	AFRICA [SouthAfrica]	Cross-sectional	Roche Linear Array	≥18	Men in the community/clinic	181	0.6-1.8[1]
Wang 2019	2016	ASIA [Taiwan]	Cross-sectional	EasyChip genotyping array	20-70	Men and women in the community/clinic	M:92 F:8	3.0[1] 2.0[2]
Wong 2018	NS	ASIA [Hong Kong]	Cross-sectional	PCR Next generation sequencing	18-64	Men and women in the community/clinic	M:680 F:745	M:3.5[1] F:1.6[1]
Bumrungthai 2019	NS	ASIA [Thailand]	Cross-sectional	PCR	1-60	Males and females in the community/clinic	M:227 F:367	M:2.2[1] F:4.6[1]
Chen 2016	2012-2015	ASIA [China]	Case-control	Flow-through hybridization & Gene chip	20-80	Healthy control men and women in the community/clinic		3.2[1]
Hearnden 2018	2013	EUROPE [United Kingdom]	Cross-sectional	PCR	18-60	Men and women in the community/clinic	M:424 F:276	M: 3.1[1] F: 0.8[1]
Ciccarese 2017		EUROPE [Genoa]	Cross-sectional	PCR	18-82	Men and women in the community/clinic	M:79 F:46	M:37.0[1] F:37.0[1]

Drago 2018	2015-2017	EUROPE [Italy]	Review of medical records	PCR		Men and women in the community/clinic	274	32.8[1]
Lupato 2017	2014-2015	EUROPE [Italy]	Cross-sectional	PCR	18-35	Men and women in the community/clinic	M:253 F:247	M:253 F:247
Knight 2016	NS	EUROPE [United Kingdom]	Cross-sectional	PCR	18-25	University students	M:67 F:57	4.0[1]
Dalla 2016	NS	EUROPE [Austria]	Cross-sectional	PCR	18-20	Adolescents & adults in the community	310	18.1[1]
Grun 2015	2013-2014	EUROPE [Sweden]	Cross-sectional	PCR	15-23	Adolescents & young adults in the community	M:87 F:211	M:0.0[1] F:2.1[1]
Tatar 2015	2004-2013	EUROPE [Hungary]	Medical records	PCR	16-82	Men and women in the community/clinic	209	5.7[1]
Ortiz 2018	2014-2016	NORTH AMERICA [Puerto Rico]	Cohort	PCR	40-65	Men and women in the community/clinic	M:204 F:536	M: 10.3[1] F: 3.9[1]
Winer 2018	2011-2012	NORTH AMERICA [USA]	Cohort	PCR	30-50	Women in the community/clinic	403	20.6[1]
Orosco 2016	2009-2012	NORTH AMERICA [USA]	NHANSE survey	Roche Linear Array	18-69	Men and women in the community/clinic	M:4600 F:4656	M:12.2[1] F:4.0[1]
D'Souza 2016	2010-2012	NORTH AMERICA [USA]	Randomised Controlled Trial	PCR	18-25	Adolescents & young adults in the community	M:213 F:196	M:15.4[1] F:5.6[1]
Gonzalez 2015	2009	NORTH AMERICA [Mexico]	Cross-sectional	PCR	15-71	Adolescents & adult women in the community	390	14.0[1]
Chatuverdi 2015	2009-2012	NORTH AMERICA [USA]	NHANES survey	Roche Linear Array	14-69	Adolescents & adults in the community	9480	M:10.5[1] F:3.1[1]
Bui 2015	2013	NORTH AMERICA [USA]	Cross-sectional	PCR	18-45	Women in the community	126	24.6[1] 16.7[2]

Beachler 2015	2010-2011	NORTH AMERICA [USA]	Cohort	Roche Linear Array		Men and women in the community/clinic	469	20.0[1]
Rajendra-Santosh 2019	2016-2017	SOUTH AMERICA [Jamiaca]	Cross-sectional	Roche Linear Array	≥18	Men and women in the community/clinic	104	8.7[1]
Vianna 2018[3]	NS	SOUTH AMERICA [Brazil]	Cross-sectional	Hybrid Capture 2	≥18	Men and women in the community/clinic	M:66 F:32	M: 14.7[1] F:12.5[1]
Rosen 2016	2010-2011	SOUTH AMERICA [Peru]	Cross-sectional	Roche Linear Array	10-80	Males and females in the community/clinic	M:383 F:597	M:10.2[1] F:5.5[1]
Lucan-Roxburgh 2015	NS	AUSTRALIA	Cross-sectional	PCR	NS	Adolescents & adults in the community	234	3.2[1]

1*- overall/any HPV prevalence;* ***2*** *– any HR-HPV; 3- HIV positive population;* ***4****– compared two methods of oral sampling; PCR – Polymerase Chain Reaction; NS – Not stated;*

Table 1.5: Prevalence of Anal HPV in men and women (2014-2018]

AUTHORS	YEAR DATA WAS COLLECTED	CONTINENT/ COUNTRY	STUDY DESIGN	HPV DETECTION METHODS	AGE (Range) years	STUDY POPULATION	SAMPLE SIZE N	PREVALENCE (%)
Chinyowa 2018[2]	2014-2015	AFRICA [Zimbabwe]	Cross-sectional	PCR	≥18	Men and women in the community/clinic	M:64 F:88	M:20.4[1] F:60.3[1]
Mbulawa 2017[2]	2012-2014	AFRICA [South Africa]	Cross-sectional	GeneXpert HPV vs Hybrid Capture 2	NS	Women in the community/clinic	200	40.8[1] vs 41.8[1]
Goeieman 2017	2011-2013	AFRICA [South Africa]	Cross-sectional	NS	25-65	Women in the community/clinic	200	43.0[3]
Ciccarese 2017		EUROPE [Genoa]	Cross-sectional	PCR	18-82	Men and women in the community/clinic	M:68 F:27	M:43.0[1] F:43.0[1]
Chikandiwa 2017[2]	2012-2013	AFRICA [South Africa]	Cross-sectional	PCR	≥18	Men in the community/clinic	304	52.0[3]
Heard 2016[2]	2007-2012	EUROPE [France]	Cohort	Roche Linear Array		Women in the community/clinic	392	47.6[3]
Ramautarsing 2015		ASIA [Thailand]	Cross-sectional	Roche Linear Array	32-40	Women in the community/clinic	102	18.8[1] 11.1[3]
Gandra 2015[2]	2011-2013	USA	Medical records	Hybrid Capture 2	42-56	Women in the community/clinic	74	27.0[3]
Maia 2014	NS	SOUTH AMERICA [Brazil]	Cross-sectional	Hybrid Capture 2 vs PapilloCheck®	≥18	Men and women in the community/clinic	42	52.3[1] vs 66.7[1]
Tosato-Boldrini 2018	2013-2016	SOUTH AMERICA [Brazil]	Cross-sectional	PCR	18-69	Men and women in the community/clinic	M:80 F:143	M:71.3[1] W:67.1[1]
Smelov 2018	2006-2009	EUROPE [Russia]	Cross-sectional	PCR	≥18	Men in the community/clinic	280	15.7[1]
Posso 2018	2005-2010	SOUTH AMERICA [Mexico]	Cohort	PCR	18-70	Men in the community/clinic	665	15.0[1]
Perez-Caraballo 2018	NS	NORTH AMERICA [Puerto Rico]	Cross-sectional	PCR	16-64	Women in the community/clinic	524	8.7[1]

***1**- overall/any HPV prevalence; **2**- HIV positive population; **3** – any HR-HPV; PCR – Polymerase Chain Reaction; NS – Not stated*

Table 1.6: Prevalence of vulvar HPV in women (2012-2018]

AUTHORS	YEAR DATA WAS COLLECTED	CONTINENT / COUNTRY	STUDY DESIGN	HPV DETECTION METHODS	AGE (Range) years	STUDY POPULATION	SAMPLE SIZE N	PREVALENCE (%)
Wei 2018	2014	ASIA [China]	Cohort	PCR	18-55	Women in the community	2,327	13.3[1] 12.8[2]
Sahasrabuddhe 2014	NS	USA	Medical records	PCR	Median age 28.0	Women at the Colposcopy clinic	72	82.0[1] 72.0[2]
Howell-Jones 2012	2008	UK	Cross-sectional	Roche Linear Array	< 25.0	Women recruited for STI screening	3829	34.6[2]

***1**- overall/any HPV prevalence; **2** – any HR-HPV; PCR – Polymerase Chain Reaction; NS – Not stated*

1.4.2. Association between HPV infection and the changing pattern of sexual behaviours

In the past two decades, there has been a rising global prevalence, as well as incidence, of HPV infections and HPV-related cancers in genital and non-genital anatomic sites [7, 141, 142]. This is believed to be due to changing sexual behaviours among general and key affected populations, including earlier sexual debut, increased number of multiple partners, and increased oral and anal sexual intercourse [6, 143, 144]. Similarly, studies have highlighted the role of oral and anal sex in the increasing incidence and prevalence of other STIs in the oro-pharynx and in the anus [145-147].

Available data from the United Kingdom, United States of America, Australia and Europe have shown that oral and anal sexual behaviours are increasingly reported together with vaginal sex among adolescents and young adults, FSWs and other key affected populations [148-154]. For example, Mercer *et al* compared trends of oral and anal sex in the UK general population using the National Survey of Sexual Attitudes and Lifestyles (Natsal 1, 2, and 3) datasets among 16-44 year old from 1990 – 2012[155]. The reported prevalence of any anal sex within the past year among women was 6.5% between 1990-1991 (Natsal 1), 11.3% between 1999-2001 (Natsal 2), and 15.1% between 2010-2012 (Natsal 3)[155]. The proportion of women that had oral sex in the preceding year also increased from 65.6% in the first survey to 76.8% in the second survey, and 75% in the last survey [155]. The proportion of men who have performed oral sex in the last year was 69.7% in Natsal 1, 77.9% in Natsal 2 and 77.1% in Natsal 3, while the proportion of men who received oral sex was 7% in Natsal 1, 12.2% in Natsal 2 and 17% in Natsal 3[155].

There is emerging evidence that sexual behaviours may also be changing in SSA that could, in turn, increase the incidence of HPV infections in oral and anal anatomic sites as well as in cervical and penile sites. Although a systematic review on anal sex showed that anal sex is being practiced among youth in SSA, information on anal sex among adult populations reporting heterosexual anal sex has not been systematically reviewed [156]. It is also not very clear how oral sexual practices among adolescents and adults are being investigated and reported in the sub-region. This thesis presents a systematic review on the reported oral and anal sex among adolescents and adults reporting heterosexual sex in SSA that shows that these behaviours are commonly reported among men and women[157]. In brief, the

prevalence of having ever practiced oral sex ranged from 1.7% to 47.2% and having ever practiced anal sex ranged from 0.3% to 46.5%. Higher prevalences of both sexual behaviours were reported among key affected populations such as FSW and also amongst men in the general population compared with women in the general population[157].

1.5. RATIONALE FOR THE STUDIES IN THIS THESIS

Although the prevalence of cervical HPV is high in SSA, there is a paucity of robust data on the prevalence of HPV in other genital and non-genital sites among healthy adolescents and adult women in the general population and among FSWs, particularly in West African countries such as Nigeria. The prevalence of reported oral and anal sex in SSA among people practicing heterosexual sex is unknown. Another critical gap is the lack of published qualitative studies on oral and anal sexual behaviours among men and women in the general and key affected populations in Nigeria, a country that is characterised by complex socio-cultural beliefs and practices. In addition, the association between oral and anal sexual behaviours and HPV infections in the general populations or in FSWs, has not been well explored in the West African sub-region. These gaps make it difficult to understand the importance of these changing sexual behaviours on the burden of HPV infections and HPV-associated cancers in the sub-region.

Presently, there are no nationally representative data on the HPV-related cancer burden in Nigeria but estimates from extrapolation of local studies show that the country has one of the highest burdens of cervical cancer in the world, after eastern and southern African countries. It is estimated that 14,943 new cervical cancer cases and 10,403 related deaths occur each year in Nigeria, accounting for 27.2% of cervical cases and 20.0% of cervical cancer deaths in West Africa[7]. A study in Nigeria reported that the age-standardized incidence rates per annum for some HPV attributable cancers among women are as follows: 28.3 per 100,000 for cervical cancers, 0.6 per 100,000 for anal cancers, 0.5 per 100,00 for vulvar cancers and 0-0.3% per 100,000 for oropharyngeal cancers[158]. The crude death rate in 2012 attributable to cervical cancer was 17.1 per 100,000 [7, 159]. There are no published data on crude death rates for vulvar, vaginal, anal or oropharyngeal cancers in Nigeria.

In the past two decades, studies on HPV infections among Nigerian women were generally limited to the cervix. The reported prevalences of cervical HPV infections ranged between 3.5%-37.0% [91, 160-163]. The results from these studies varied according to HIV status, the

DNA techniques that were used, and age; the highest prevalence of HPV occurred among the younger populations. Despite the reported oral and anal sexual behaviours among adolescent girls and women in Nigeria, there are no published data on the prevalence of oral, anal or vulvar HPV infections.

In order to fully understand the impact of changing sexual behaviours on the prevalence of HPV infections in Nigeria, it is important to learn about the socio-cultural interpretations of sexual behaviours, which are often considered to be a very sensitive topic of discussion in the community. Information on terminologies or colloquial terms as well as perception and meaning of oral and anal sexual behaviours among people practicing heterosexual sex are not well documented in Nigeria or West Africa.

The Sexual Behaviour and HPV Infection in Nigerians in Ibadan (SHINI) study presented in this thesis aims to address these gaps by seeking to understand the epidemiology of HPV infections in genital, oral and anal niches and their association with sexual behaviours among women in the community and brothels in Ibadan, Nigeria. This research has the potential to fill a critical gap in scientific knowledge and influence policy and programming in the country, as well as in SSA through sharing of findings with the appropriate authorities. The study will provide information on the prevalence of HPV infections in sexually active adolescents and adults. It will also generate data on sexual behaviours and associated risks of HPV infection in the community.

1.6. AIMS AND OBJECTIVES

The aim of this thesis is to describe the epidemiology of HPV infections and the patterns of genital, oral and anal sexual intercourse associated with prevalence of genital, oral and anal HPV infections among sexually active older adolescents (≥18 years) and adults and FSWs aged 18-45 years in Ibadan, Nigeria.

The specific objectives are to:

1. explore knowledge, socio-cultural interpretation and different ways of learning sexual behaviours among older adolescents and adults in the community, and among FSWs in Ibadan;
2. describe attitudes, motivations, potential health risks and stigma associated with engaging in oral and anal sexual behaviours among older adolescents and adults in the community, and FSWs in Ibadan;

3. determine the prevalence of oral, genital (cervical and vulvar) and anal HPV infections among older adolescents, adult females in the community and FSWs in Ibadan;
4. determine the risk factors associated with any HPV infection in each of the anatomic sites (cervix, oral cavity, vulvar and anal cavity) among older adolescents and adult females in the community, and FSWs in Ibadan; and
5. examine the concordance of HPV genotype-specific infections in different anatomical sites among older adolescents and adult females in the community, and FSWs in Ibadan.

1.7. NIGERIAN CONTEXT AND STUDY SETTING

Nigeria, with an estimated population of 201 million, is the most populous country in Africa, and more than half of its population is less than 40 years of age[164]. Nigeria operates a presidential system of government comprising of the Federal, State and Local government authorities. The country has 36 states and 774 local government areas (LGAs) for administrative and political purposes. Each LGA is headed by a chairman that is usually elected for a term of three years in accordance with the Nigerian constitution, and in absence of an elected chairman, a caretaker committee is appointed by the Governor of the state before election is conducted. Each community within an LGA has a traditional ruler or village head that oversees daily activities of the community with his chiefs. In addition, each community has a representative on the social mobilization sub-committee at the LGA. The committee acts as liaison and advisory body on health-related issues including conduct of scientific research in the community. There are over 500 languages in Nigeria and the major ethnic groups are Hausa, Yoruba and Igbo accounting for 25.0%, 21.0% and 18.0%, respectively[165]. The main religions are Christianity, Islam and Traditional African religion[164]. The country is largely patrilineal, particularly in rural communities[166, 167].

Nigeria, with a gross national income per capita of 5,360 United States Dollars (USD), has an average life expectancy at birth of 55 years for males and 56 years for females [168]. Nigeria has never achieved the minimum required spending on health of 15.0% set by the UN [168, 169]. The country has three levels of health systems: the primary level controlled by the Local

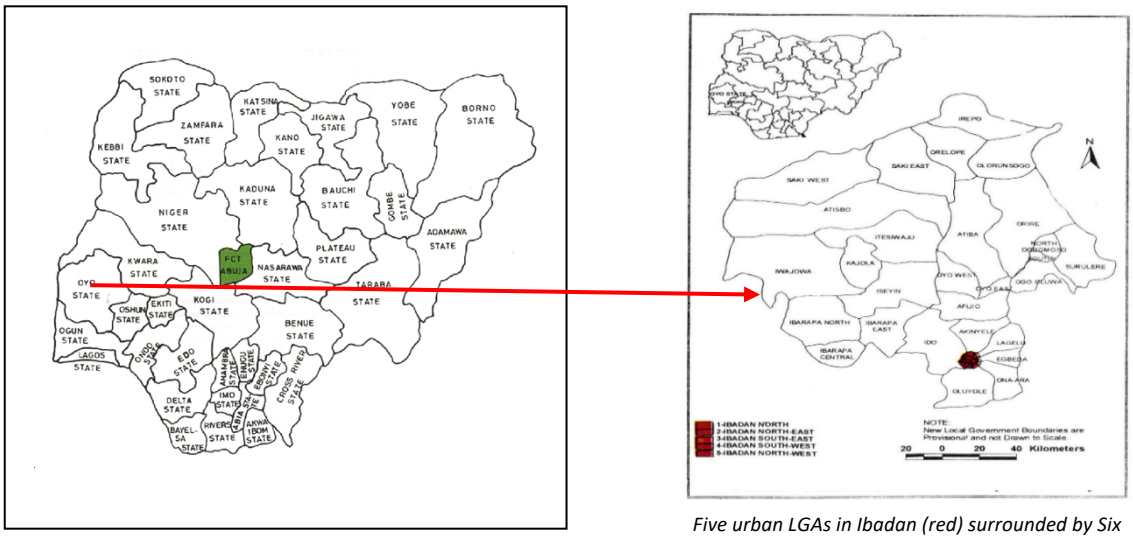
Government, the secondary level controlled by the State Government, and the tertiary level controlled by the Federal Government [169]. Nigeria currently has 29,854 primary health care, 3,768 secondary health care and 47 tertiary health care facilities[170]. About 73.0% of these health facilities are owned by the government, 12.0% are owned by the private sector, 14.0% are owned by both government and private sectors and 1.0% are faith based organisations[170]. Although the country has a National Health Insurance scheme, this only covers approximately 5.0% of the population [171, 172]. The healthcare system is therefore largely driven by out-of-pocket expenses. Screening for non-communicable diseases including cancer is usually performed without clear national guidelines[172]. Traditional healthcare in the community is a recognized alternative form of healthcare that involves the use of locally made herbs and incantations.

Nigeria currently ranks fourth among countries with people living with HIV infection after India, South Africa and Mozambique. The acquisition of HIV infection in Nigeria is largely driven by heterosexual vaginal sex among general and key affected populations[173]. It is not known what proportion of new cases of HIV and STI in Nigeria may be due to condomless heterosexual oral and anal sexual practices [174-176].

The Nigerian constitution forbids sex in exchange for money or favours, and any business that may be associated with it[177]. FSWs suffer discriminations and abuse from people in the community [178]. In spite of legal restrictions, the Federal Ministry of Health and some international donor agencies routinely collect health related data from FSWs and other key affected population groups [179]. Government and donor agencies also offer interventions to minimize health risks among FSWs and in the community[180, 181]. For instance, Nigeria has conducted three Integrated Biological and Behavioural Surveillance Surveys (IBBSS) in 2007, 2010 and 2014 among MSM, FSWs, people who inject drugs and other high-risk groups in the country, such as transport workers, officers, men of the Armed Forces and the Police [180]. Several HIV prevention programmes such as HIV counselling and testing, negotiation skills for condom use and access to anti-retroviral drugs are being supported by the Federal Government of Nigeria and their partners for FSWs and other key affected population groups[182].

The SHINI study was conducted in Ibadan metropolis. Ibadan is the commercial and the political capital city of Oyo state, which is located in the southwestern region of Nigeria. Oyo state has 33 LGAs councils. At the time of the 2006 Nigerian census, Ibadan had a population of 2,550,593 with a population growth rate of 2.35 %[183]. Administratively, the metropolis has 11 LGAs councils consisting of five urban LGAs in the city (Ibadan North, Ibadan North-East, Ibadan South-East, Ibadan South-West and Ibadan North-West) and 6 peri-urban LGAs (Akinyele, Lagelu, Egbeda, Ona-Ara, Oluyole and Ido) [184]. Two Nigerian premier tertiary institutions – the University of Ibadan and the University College Hospital – are located in the metropolis.

Figure 1.2: The map of Nigeria with 36 States and Federal Capital Territory; LGAs in Oyo state and Ibadan Metropolis



Five urban LGAs in Ibadan (red) surrounded by Six peri-urban LGAs

1.8. STRUCTURE OF THIS THESIS

This thesis consists of six chapters. This introductory chapter has introduced the topic of HPV, along with its natural history, pathogenesis of infections, screening and detection strategies, epidemiology, and related morbidities in the oral and anogenital sites. It has also described the current gaps in knowledge and outlined the aims and objectives of the PhD thesis.

Chapter 2 will systematically review the published literature on the prevalence of reported oral and anal sex in sub-Saharan Africa. This systematic review has been published in the Reproductive Health Journal.

Chapter 3 will describe a qualitative formative study to (explore knowledge and perceptions, interpretations, local terminologies, motivations and potential health risks associated with heterosexual oral and anal sexual behaviours) carried out among older female adolescents (≥18 years) and adults in the community and among brothel workers in Ibadan. This chapter will present the methods, results and a brief discussion. Results from this study were used to develop the questionnaires for the studies described in Chapters 4 and 5.

Chapter 4 will present the cross-sectional study to determine the prevalence of and risk factors for HPV infections in the cervix, oral cavity, vulvar and anal canal among older adolescents/young adults in Ibadan. This chapter will present the methods, results and a brief discussion of the results.

Chapter 5 will present the cross-sectional study (which will determine the prevalence of and risk factors for HPV infections in the cervix, oral cavity, vulvar and anal canal) carried out among brothel workers in Ibadan. This chapter will present the methods, results and a brief discussion of the results.

In Chapter 6, the results of chapters 3, 4 and 5 will be discussed, including the strengths and limitations of the research. This chapter will conclude with recommendations for future studies and programmes, as well as a discussion of areas for future research.

1.9. SCOPE OF WORK CONDUCTED BY THE PHD CANDIDATE

This section describes the role of the PhD candidate Imran Morhason-Bello (IMB) and others in different aspects of this research work. IMB led the draft of the systematic review protocol and the design of the data extraction tool, registered the protocol in the Prospero database, conducted the literature search, screened and retrieved titles and abstracts with another reviewer, extracted and synthesized the data, and wrote the first draft of the manuscript (Chapter 2). Professor Deborah Watson-Jones (DWJ) and Dr. Suzanna C. Francis (SCF), IMB's PhD supervisors, supervised the design and development of the systematic review protocol, literature search, data extraction and synthesis and reviewed and comments on drafts of the manuscript.

With regards to the field research work, IMB conceptualized the study idea with DWJ and SCF. He drafted the study protocol and data collection tools and developed the field procedures

manual with the guidance and support of DWJ, SCF and the PhD advisory committee members. IMB managed the fieldwork and led and coordinated all field activities from Ibadan. These activities involved the recruitment of field staff, the training of staff, and the daily coordination of the fieldwork for both the qualitative and the cross-sectional studies. For the qualitative study, IMB coded the transcripts with two other independent researchers experienced in the use of Nvivo software (QSR International Pty Ltd. Cardigan UK). The final analysis of the qualitative data and the report writing was performed by IMB and supervised by IMB's PhD supervisors and advisors.

With regards to the cross-sectional study, the HPV genotyping was conducted at the Catalan Institute of Oncology (ICO), Spain, by a team of laboratory scientists led by Dr Miquel Pavon. IMB visited the ICO laboratory to observe how the genital, oral and anal samples were analysed. IMB led on the cleaning of the data with one of the data analysts that performed double data entry. IMB wrote the do-files and carried out the statistical analysis, generated results and wrote the thesis under the supervision by DWJ and SF, and advisors. Dr. Kathy Baisley supervised the statistical components of the field work.

2.0. SOURCE OF FUNDING

The management of University of Ibadan, Nigeria, funded IMB's research degree programme (salary and school fees), and the research work as part of the capacity building programme for young academics employed by the institution

CHAPTER 2: LITERATURE REVIEW ON ORAL AND ANAL SEXUAL BEHAVIOURS

2.1. PREAMBLE

According to the WHO , the global burden of STI is very high, compromising the quality of life, including sexual and reproductive health, of a large number of people worldwide [185]. Current estimates indicate more than one million people acquire an STI every day, primarily from penetrative (vaginal, oral and anal sex) and non-penetrative (masturbation) sexual contacts [185, 186]. Sexual behaviours among adolescents and adults need to be properly understood in order to appreciate the burden of associated health risks such as STIs and other associated morbidities, such as cancers, globally. Although a review from SSA synthesised information among young people reporting heterosexual anal sex, there are no such reports on oral sex [156]. In addition, published information on oral and anal sex among adults in heterosexual relationships has not been systematically reviewed and synthesised among studies carried out in SSA.

Collection of data on sexual behaviours is complex due to the sensitive nature of the subject [187-189]. Over the years, some researchers have tried to improve on the quality of information collected by using simple and clear definitions for different sexual behaviours. The aim was to improve comprehension and elicit correct responses from participants without any emotional harm [188, 190]. Clear definitions of sexual behaviours improve the ability to compare data making it possible to generalise findings [188]. In addition, information on the roles played by individuals during sexual activities should be collected for proper profiling of risks that might be associated with such behaviours [185].

The methodology used to collect data during sexual behaviour research can also determine the quality of information that is collected [189, 191, 192]. Examples of data collection methods that are commonly used include audio computer assisted self-interviews (ACASI), computer assisted personal interviews (CASI), face-to-face interviews (FTFI), self-administered questionnaires (SAQ), telephone-and computer-assisted interviews (T-ACASI), telephone interviews with a human interviewer (TI), timeline-follow back assessments (TLFB), and use of diary self-completed methods[192]. Each of these methods has its own strengths and weaknesses. For example, data collection of sexual behaviours with interview methods

(FTFI and ACASIs) are more closely associated with recall and social desirability bias than the daily self-completed diaries, particularly when questions are asked on duration of sexual acts and number of sexual partners [193, 194]. Among different interview methods, FTFI is more closely associated with social desirability bias and under-reporting of sexual behaviours than ACASI methods[195].

Comparatively, in heterosexual relationships, there is more information on vaginal than oral and anal sexual behaviours for risk factor for STIs and other associated morbidities, especially among people engaging in heterosexual sex [190]. Apart from the general risks associated with condomless penile-vaginal sex, the health risks associated with oral and anal sexual behaviours also depend on the role of individual during sexual act. For example, receptive anal sex is riskier than insertive anal sex in acquisition of HIV and other STIs [196]. However, the risks associated with condomless oral sex are slightly different; the role of giving oral sex appear to be riskier than receiving oral sex[197]. It is important to collect detailed information that will not only record the sexual act but also document potential risks that might be associated with such behaviour [190, 198]. Such information will also provide insight into the burden of STIs, including HPV, in the community and assist policy makers and programmers to design relevant interventions that will aid prevention and treatment [190]. Whilst high quality data on oral and anal sexual behaviours are available in high-income countries such as the United Kingdom, United States and Australia [199-201], the quality of data in SSA are unknown.

This chapter presents a systematic review of published scientific articles in SSA on oral and anal sex among men and women that are reporting heterosexual sex. The review reports a range of prevalence values across different population groups, identifies associated risk factors, describes interpretations of oral and anal sex, assesses the quality of published papers, identifies gaps, and makes recommendations to improve the quality of future research from SSA on oral and anal sexual behaviours. This systematic review was carried out before the SHINI study was conducted with the aim to synthesize the published data on oral and anal sexual behaviours, the main exposures for HPV infection.

The systematic review was presented by IMB as a poster presentation at the 30th International Papillomavirus Society Conference in 2015 at Lisbon, Portugal.

The full manuscript was published in the Reproductive Health Journal in 2019. IMB developed the initial concept for this review, conducted the literature search, registered the review in Prospero databased, screened the titles and abstracts with another person, extracted the data, wrote the first draft and submitted to the Reproductive health journal. Each step was supervised by DWJ and SCF.

2.2. COVER SHEET FOR THE SYSTEMATIC REVIEW MANUSCRIPT

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RESEARCH PAPER COVER SHEET

PLEASE NOTE THAT A COVER SHEET MUST BE COMPLETED FOR EACH RESEARCH PAPER INCLUDED IN A THESIS.

SECTION A – Student Details

Student	Imran Morhason-Bello
Principal Supervisor	Professor Deborah Watson-Jones
Thesis Title	The epidemiology of, and risk factors for oro-genital and anal human papillomavirus infections among sexually active Nigerians: a mixed methods study

If the Research Paper has previously been published please complete Section B, if not please move to Section C

SECTION B – Paper already published

Where was the work published?	Reproductive Health		
When was the work published?	May 6 2019		
If the work was published prior to registration for your research degree, give a brief rationale for its inclusion	No		
Have you retained the copyright for the work?*	Yes	Was the work subject to academic peer review?	Yes

**If yes, please attach evidence of retention. If no, or if the work is being included in its published format, please attach evidence of permission from the copyright holder (publisher or other author) to include this work.*

SECTION C – Prepared for publication, but not yet published

Where is the work intended to be published?	NA
Please list the paper's authors in the intended authorship order:	NA
Stage of publication	Choose an item.

SECTION D – Multi-authored work

For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)	I designed, conducted literature search, undertook screening of literature, extracted data, analysed and wrote the first draft

Student Signature: [redacted] **Date:** 23/09/2019

Supervisor Signature: [redacted] **Date:** 30/09/2019

2.3. COPYRIGHT AGREEMENT

2.4. REPORTED ORAL AND ANAL SEX AMONG ADOLESCENTS AND ADULTS REPORTING HETEROSEXUAL SEX IN SUB-SAHARAN AFRICA: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Oral and anal sexual behaviours are increasingly reported among adolescents and adults reporting heterosexual sex in peer-reviewed journals in high income countries, but less is known about these behaviours in low and middle-income countries, especially in sub-Saharan Africa. The aim of this systematic review is to describe the prevalence of, and motivations for, oral and anal sex among adolescents and adults reporting heterosexual sex in sub-Saharan Africa.

Methods: A systematic review of published articles that reported oral and or anal sex in sub-Saharan Africa was conducted from seven databases up to and including 30th August 2018.

Results: Of 13,592 articles, 103 met the inclusion criteria. The prevalence of reporting ever practising oral sex among adolescents, university students and a combined population of adolescents/adults ranged from 1.7-26.6%, 5.0-46.4% and 3.0-47.2% respectively. Similarly, prevalences of reported ever practising anal sex ranged from 6.4-12.4% among adolescents, 0.3-46.5% among university students and 4.3-37.8% amongst combined population of adolescents and adults. Higher prevalences of oral and anal sex were reported among populations at high-risk for sexually transmitted infections and HIV and university students and, in most studies, both behaviours were more commonly reported by males than females. Heterosexual oral and anal sexual acts were associated with some high-risk behaviours such as inconsistent condom use and multiple sexual partners.

Conclusion: Reported oral and anal sex between men and women are prevalent behaviours in sub-Saharan Africa. Health professionals and policy makers should be aware of these behaviours and their potential associated health risks.

KEYWORD(S): oral/anal sex; sexual behaviour; heterosexual; adolescent; adult; sub-Saharan Africa

PLAIN ENGLISH SUMMARY

Oral and anal sexual acts are increasingly reported in peer reviewed journals, especially among adolescents and young adults in high income countries. These behaviours are associated with negative health outcomes such as STIs. Oral and anal sex may be important unrecognised modes of transmission for STIs, contributing to onward transmission. In addition, STIs in the oropharynx and anus may result in poor health outcomes such as oral and anal cancers; however, oral and anal sex are not always regarded as 'hetero-normative sexual intercourse', and are often disregarded by researchers, programmers and policy makers. Importantly, both sexual acts are sometimes perceived by some people to be safer than vaginal sex against pregnancy and STIs, and are associated with lower reported use of condoms to prevent HIV and STIs.

We conducted a systematic review of published scientific papers reporting these behaviours in SSA between 1946 and 30th August 2018. We investigated the prevalences of oral and anal sex, and factors that influenced these behaviours.

Our findings showed that oral and anal sex were commonly reported among adolescents and adults as well as FSWs. We found that more boys/men reported oral and anal sex than girls/women in most of the studies, and that a substantial number of those engaging in oral and anal sex did not use barrier methods during those sexual acts.

In summary, oral and anal sexual behaviours are commonly reported in sub-Saharan Africa among people reporting heterosexual sex. While testing for oropharyngeal and anal infections may not be feasible in resource-constrained settings, these data are important for researchers, programmers and policy makers to raise awareness of these potential modes of STI transmission. Information about the risk of STI transmission for oral and anal sex should be included in information, education and counselling programmes for both general and key populations at risk for STIs.

BACKGROUND INFORMATION

Condomless heterosexual oral and anal intercourse have been associated with extragenital STIs such as *Chlamydia trachomatis*, *Neisseria gonorrhoea*, syphilis, hepatitis, herpes simplex virus (HSV) and HPV infections in the anal and oropharyngeal niches [202-207]. Although oral and anal STIs are frequently asymptomatic they remain an important source of onward transmission [202-204, 206]. Clinical sequelae of oral and anal STIs include pain, anal discharge, ulcerative proctitis, and HPV-associated premalignant lesions and cancers [203, 204, 207, 208]. The comparative risk of HIV infection transmission between condomless anal sex and vaginal sex is higher than oral sex, and the risk is higher among those engaging in receptive anal sex than insertive anal sex when other HIV prevention methods, such as anti-retroviral treatment or preexposure prophylaxis, are not used[209, 210].

Several studies have reported a higher prevalence of oral and penile-anal sex among key affected populations' such as FSWs [211, 212], MSM[213], entertainment outlet workers, long distance drivers, and people who inject drugs, compared to general populations [214]. Most studies report low or inconsistent condom use during oral and anal sex. For example, in Lima, Peru (2010), 98.4% of FSWs aged 18-26 years had performed oral sex in their lifetime and only 20.0% reported condom use during the sexual act [212]. Another study in Peru (2013) showed that 21.2% of FSWs performed oral sex with clients in the previous month, and only 37.6% used condoms consistently while performing oral sex[215]. A study conducted in India (2009-2010) reported that 12.3 % of 18-60 year old FSWs engaged in receptive penile-anal intercourse in the past six months, and only 48.4% used condoms consistently[216]. In the Netherlands (2016), the prevalence of anal sex in the past 6 months among FSWs aged 18 years and above was 20.0%, and only 31.0% of these FSWs always used condoms with clients[217]. In the USA, a systematic review of anal sex that included published articles between 1987-2013 reported that the prevalence of anal sex among FSWs ranged between 0-18.0% and that 14.0-82.0% of these FSWs always used condoms during anal sex [218].

Oral and anal sexual behaviours are increasingly reported among adolescents and adults reporting heterosexual sex in the general population in both developed and developing countries [219-222]. For example, data from the Australian national surveys in 2001-2002 (aged 16-59 years) and 2012-2013 (aged 16-69 years) showed a moderate increase in the

prevalence of reported oral and penile-anal sex over time in both genders [219, 223]. In the United States, similar findings of increased prevalence of penile-anal sex was reported from three waves of the National Survey of Family Growth [224]. Reported penile-anal sex with the opposite sex increased from 34.0% in 2002 to 37.0% in 2006-2010 and 37.7% in 2011-2015 among men (15-44years) [224], whereas the proportion of reported anal sex among women increased from 30% in the first survey to 31.6% in the second and 33.3% in the third survey[224]. There were no significant changes in the prevalence of reported oral sex over the same period in both men and women[224]. However, a sub-analysis of the wave 2 and 3 of the National Survey of Family Growth on reported oral sex among young adults aged 15-24 years showed different patterns of change between men and women [225]. The prevalence of young men that gave and received oral sex increased from 53.9% to 55.4% and 62.9% to 64.6%, respectively, but the prevalence of ever giving and receiving oral sex decreased from 59.6% to 58.6% and 62.2% to 60.4% among young women over the same period[225].

In SSA, many studies reporting sexual behaviours in heterosexual relationships have focused on penile-vaginal sex and associated negative health outcomes [226-229]. This has influenced sexual health policies and programmes in many countries within the region [230, 231]. The role of heterosexual oral and anal sexual acts within the spectrum of sexual behaviours needs to be documented within the region in order to appreciate their potential impacts on STI transmission and other associated morbidities such as oral and anal cancers. A systematic review of the prevalence of, and motivations for, practising heterosexual oral and penile-anal sex and the cultural interpretations of these behaviours in SSA was conducted.

METHODS

This review was conducted in accordance with Preferred Items for Reporting of Systematic Reviews and Meta-analyses (PRISMA) and Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines [232, 233]. The protocol was registered in PROSPERO database with registration number CRD42015025311[234].

Search strategy

The search was conducted in English using seven databases: Medline; Embase; African-Wide Information; Cinahl; Global Health; Scopus; and Popline databases. We used medical subject headings (MeSH) and text words related to oral and anal sex for the search. The terms used for oral sex were oral (sex OR sexual behaviour OR sexual practices), cunnilingus, oral vaginal contact, fellatio, oral penile contact, anilingus, and oral anal contact. The search terms for anal sex included anal (anus OR anal cavity) sex OR anal (sexual behaviour OR sexual practice) or ano-genital (sex OR intercourse). The search was restricted to SSA by using "AND" before adding different search terms for sub-regions (West Africa OR East Africa OR Central Africa OR Southern Africa), and by specific country names. Multi-continent studies that had separate data from any country in SSA were also considered. The search included published articles from 1946 up to and including the final search of 30th August 2018. Manual searches of bibliographies of relevant publications on the subject were conducted. All titles retrieved from the search were compiled and reviewed with Endnote X 8.0 (Thompson Reuters) by one author (IMB); duplications were removed using the Endnote automated system and through a manual check.

Eligibility criteria

The eligibility criteria were determined *apriori* in the registered protocol [234], and only published original research articles that reported on oral or anal sex with a partner of the opposite sex in adolescents and adults in SSA were considered. The review excluded articles that focused exclusively on non-consensual heterosexual intercourse and MSM, even if men reported sex with both men and women. Commentaries or review articles, letter to editors, editorials, case series and case reports were also excluded. Oral sex was defined as oral contact with the vulva and or vagina (cunnilingus) or penile shaft (fellatio) or anus (analingus). Anal sex was defined as penetration (insertion) of a man's penis into the woman's anus or, for women, reception of the penile shaft into the woman's anus.

Two authors (IMB, SK) independently screened the titles and abstracts using the eligibility criteria. Thereafter, the full-text of selected articles were independently reviewed again by IMB and SK. Discrepancies at each stage of the review were resolved through discussion and

consensus. DWJ and SCF served as arbitrators for cases that could not be resolved by discussion.

Data extraction

Data were extracted by IMB into pre-specified data extraction form prepared in Microsoft Excel 2010, and verified by SK. The data extracted included the authors' and journals' names, sampling methods, study location, definition of oral and anal sex, and prevalence/proportion of those that reported oral and anal sex, including reasons/motivations and risk factors associated with these behaviours. Prevalence was defined as the proportion of those that reported oral/anal sex divided by the total number of individuals in the study population.

For reporting periods, studies that used "ever had" or "ever experienced" or "life-time experience" for oral and or anal sex were classified as "ever practiced". Other specific look-back reporting periods recorded were "past 12 months", "past 3 months", "past 1 month", "last sexual act" and the "first sexual act". Studies that used any form of random sampling were classified as "probability sampling" while others that used non-probability techniques were categorised as "convenience", "snowball", or "venue-based" or "volunteer" sampling. Studies that had participants with increased risk of STI were categorised as key affected populations (e.g. FSWs, HIV positive men and women, recreational facility workers such as bar and guesthouse workers, long distance truck drivers and participants described as "high-risk" in the methods sections of eligible publications).

Assessment of quality of eligible studies

Separate risk of bias tools were used to assess the quality of papers reporting quantitative and qualitative data. For papers reporting quantitative data, a validated tool for observational studies was modified (supplementary figure 3) [235] by developing a list of methodological features of the eligible studies that could bias the prevalence and risk factor estimates for oral and anal sex. For each study, documentation of the following items were assessed to classify the study as being either at lower or higher risk of bias: description of study population (Yes/No); type of sampling techniques (probability sampling [Yes] or non-probability sampling/not reported [No]); response rate (Yes/No); eligibility criteria (Yes/No); definition of oral sex (Yes/No); definition of anal sex (Yes/No); sexual behaviour roles reported as

giving/insertive or receptive/received (Yes/No); risk factor estimates controlled for potential confounders (Yes/No); and inclusion of a statement on the ethical approval (Yes/No). For papers reporting qualitative data, a critical appraisal skill programme tool was used for qualitative studies (supplementary figure 4) [236]. Each tool has ten fields for assessment; studies with five or more "Yes" fields were considered to be of lower risk of bias.

Data synthesis

Due to the heterogeneity in study populations, study design, sampling strategy, and definitions of exposure of interest in the eligible studies, a descriptive analysis of both quantitative and qualitative studies were performed without providing a pooled estimate by meta-analysis. In the descriptive analysis, data were disaggregated by exposure of interest (oral sex, anal sex or both), gender, population category (key affected or general population), country locations and regions. The prevalence of outcomes (oral and anal sex) and risk factors for oral and anal sex in quantitative studies were presented. Minitab 18.0 statistical software (Minitab, Inc.) was used to graphically present individual value plots of the prevalence of oral and anal sex by sub-region, study population, population category and risk of bias to visualise the range in reported prevalence compared by population type, geographical area and risk of bias. Key findings from qualitative studies were summarised and categorised into the following themes: cultural meaning; interpretations; and reported personal experiences.

RESULTS

Out of the 13,592 articles retrieved, 155 full-text articles were reviewed and 103 were included in the descriptive analysis of heterosexual oral and or anal sexual behaviours (***Figure 2.1***). Among the 103 articles reviewed, 38 reported on both oral and anal sex [174, 175, 237-273], 53 reported on anal sex only [274-325] , and 12 reported on oral sex only [176, 326-336]. One Nigerian publication out of the 38 articles reported the prevalence of oral and anal sex as a combined outcome[245]. Six articles were mixed methods studies (a study each from Ethiopia, Kenya, Nigeria, Tanzania, Zambia and another was conducted in Kenya and Rwanda) [241, 266, 270, 290, 320, 333]. Fifty-nine studies were from Southern Africa, 38 were from East Africa, 20 were from West Africa and four were from Central Africa (***Table 2.1***).

Only nine quantitative studies presented the operational definitions of reported oral sex [239, 240, 252, 254, 266, 271-273, 336] and six studies presented operational definitions of reported anal sex[240, 252, 254, 266, 273, 290] in the methods section of the papers. For oral sex, definitions included oral stimulation of either the external female genitalia (i.e. clitoris, vulva and vagina) or the penis [239]; ejaculation during oral stimulation of the male genitalia[240]; contact between the mouth and penis or vagina or anus [254]; and putting one's mouth on their partner's penis or vagina or letting their partner put his or her mouth on one's penis or vagina [252]. For anal sex, definitions included were ejaculation during anal sex [240]; introduction of the penis into the anus or back passage of the partner [254, 266, 273, 290]; and putting the penis into the partner's anus or letting the partner insert his penis to her anus[252].

Twelve out of 13 articles presented qualitative data investigating motivations, cultural interpretations and personal experiences of anal sex [266, 290, 300-304, 320, 322-325] (Table 1). Of these, seven studies (two from South Africa [300, 301] and three from Tanzania[303, 304, 324], and two multi-country studies conducted in Kenya, Tanzania and Uganda [302] and Uganda, South Africa and Zimbabwe [323]) used qualitative methods only. Six qualitative studies each on anal sex were conducted among key affected populations [290, 302-304, 324, 333] and general populations [266, 300, 301, 320, 322, 323]. No studies included adolescents. One article reported on perception of FSWs on the use of condom for oral sex [333].

Figure 1:3 PRISMA Flow for the systematic review

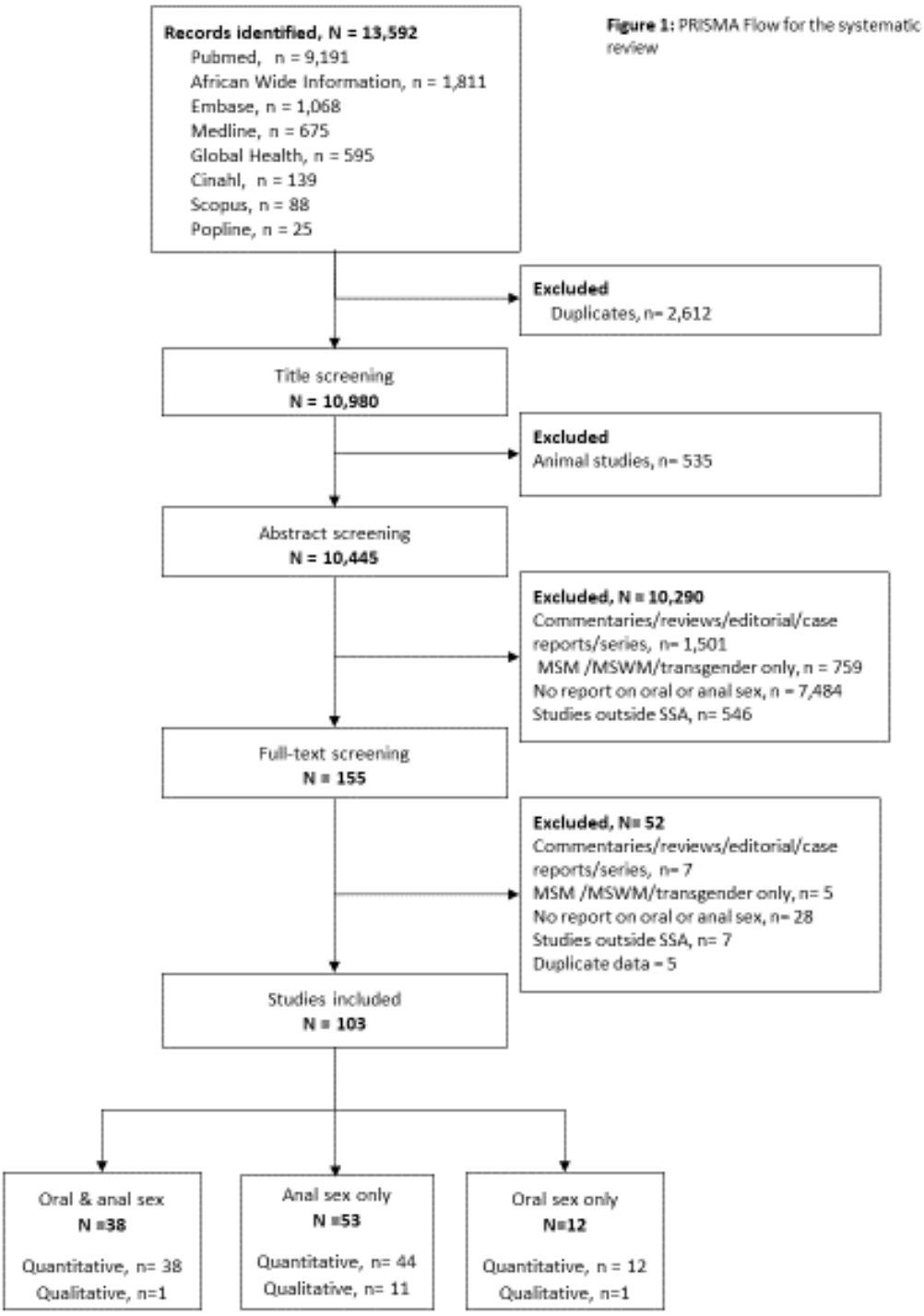


Figure 1: PRISMA Flow for the systematic review

Table 2.1: Selected data from quantitative studies reporting on heterosexual oral and anal sex in sub-Saharan Africa by year of publication

GP – General Population; KAP - Key Affected Population.

M – Male; F – Female; X – Not reported; Kig – Kigali; Mom – Mombasa; NS – Not stated; Pry - Primary; Sec –Secondary; RCT – Randomised Control Trial; Ref – References; ¥ - Okafor et al reported proportion of boys and girls that had practiced oral and heterosexual anal sex as a single outcome.

Author; Year	Country	Study design	Sampling; Data collection methods	Study population	Sample size	Gender (M/F); Age (yrs)	Oral sex			Anal sex			Assessment of Risk of Bias
							Reported Prevalence (%)		Reporting period	Reported Prevalence (%)		Reporting period	
							Receptive	Insertive		Receptive	Insertive		
Soyinka 1979	Nigeria	Cross-sectional	Probability sampling; Self-administered interview	University students (GP)	802	M&F; NS	5. 0		Ever practiced	0.3		Ever practiced	high risk of bias
Van de Perre et al 1985	Rwanda	Case control	Convenience sampling; Medical records	FSW (KAP)	118	F; 16-42	1.8	0.5	Ever practiced	2.3	X	Ever practiced	high risk of bias
Wilson et al 1989	Zimbabwe	Cross-sectional	Convenience sampling; Not reported	FSW & Male clients (KAP)	200	M:18-48	M: 10.0	M: 4.0	Last sexual act	FSW: 9.0	M: 11.0	Last sexual act	high risk of bias
						F: 17-40	FSW: 1.0	FSW: 1.0					
Katsivo et al 1991	Kenya	Cross-sectional	Volunteer based sampling: Face-to-face interview	Women working in food & recreational facilities (KAP)	250	F: ≥18	X	X	x	0.4	x	Ever practiced	high risk of bias
Akande 1994	Nigeria & Zimbabwe	Cross-sectional	Quota sampling; Self-administered interview	University students (GP)	1449	M&F; 17-21	Nigeria: 46.4		Ever practiced	Nigeria: 28.2		Ever practiced	high risk of bias
							Zimbabwe: 35.2			Zimbabwe: 11.8			

Cossa et al 1994	Mozambique	cross-sectional	Convenience sampling; Face-to-face interview	Adolescent & Adults women in community (GP)	1728	F: 14-45	0.2		Ever practiced	0.2	X	Ever practiced	high risk of bias
Feldman et al 1997	Zambia	Mixed methods	Probability sampling; Face-to-face interview	Adolescents & Adults in schools/community (GP)	276	M&F; 14-20	25.3	11.7	Ever practiced	10.0		Ever practiced	high risk of bias
Abdool karim et al 1998	South Africa	Cross-sectional	Not reported; Method of interview not reported	FSW (KAP)	145	F: 24	X	X	X	42.8	X	Ever practiced	high risk of bias
Matasha et al 1998	Tanzania	Cross-sectional	Probability sampling; Self-administered interview	Adolescents in schools/community (GP)	Pry (M: 276; F: 308)	M&F; Pry: 10-19	Pry (M: 39.0; F: 40.0)		First sexual act	Pry(F):9.0;	Pry (M): 8.0;	First sexual act	low risk of bias
					Sec (M: 206; F: 102)	M&F; Sec:14-19	Sec (M: 2.0; F: 12.0)			Sec (F): 0	Sec (M): 0.5		
Tengia-Kessy et al 1998	Tanzania	Cross-sectional	Probability sampling; Face-to-face interview	Adolescents & Adults in schools/community (GP)	M: 476	M&F; 15-24	M: 5.7		Ever practiced	X		X	high risk of bias
					F: 527		F: 4.7						
Fawole et al 1999	Nigeria	Revised medical records	Convenience sampling; Medical records	Adolescents in schools/community (GP)	119	M&F; 15-19	1.7		Ever practiced	X		X	high risk of bias
Sallah et al 1999	Togo	Cross-sectional	Probability sampling; Face-to-face interview	University students (GP)	954	M&F:≥15	20.6 vs 36.1		Ever practiced	37.8	X	Ever practiced	low risk of bias
Okesola et al 2000	Nigeria		Convenience sampling;	Adolescents & Adults in	69	M&F; 17-74	3. 0		Ever practiced	X		X	high risk of bias

		Revised medical records	Medical records	schools/community (GP)								
Fonck et al 2000	Kenya	RCT	Snow ball sampling; Face-to-face interview	FSW (KAP)	318	F; 18-57	X		X	14.0	X	Ever practiced	low risk of bias
Gathece et al 2000	Kenya	Mixed methods	Not reported: Face-to-face interview	FSW (KAP)	322	F: Mean 30.5	9.0		Ever practiced	X	X	X	high risk of bias
Ramjee et al 2002	South Africa	Cross-sectional	venue based sampling; Face-to-face interview	Truck drivers (KAP)	391	M; 18-71	X		X	X	42.0	Ever practiced	low risk of bias
van Damme et al 2002	South Africa	RCT	Venue-based sampling; Face-to-face interview	FSW (KAP)	765	F: >=16	X	X	X	14.1	X	Ever practiced	low risk of bias
Kalichman et al 2004	South Africa	Cross-sectional	Convenience sampling; Self-administered interview	Adult women in community (GP)	272	F; 25-35	X		X	18.8	X	Past 3 months	high risk of bias
Nicholas 2004	South Africa	Cross-sectional	Convenience sampling; Self-administered interview	University students (GP)	M: 482 F: 775	M&F; 17-24	M: 22.8 F: 18.2		Ever practiced	F: 8.4	M: 10.8	Ever practiced	high risk of bias
Dunkle et al 2005	South Africa	Cross-sectional	Volunteer sampling; Face-to-face interview	FSW (KAP)	316	F:16-43	24.1		Ever practiced	5.8	X	Ever practiced	low risk of bias
Nnoruka et al 2005	Nigeria	Cross-sectional	Convenience sampling; Not reported	HIV positive men & women (KAP)	31	M&F; 23-32	13.3		Ever practiced	3.3		Ever practiced	high risk of bias

Okafor et al 2005¥	Nigeria	Cross-sectional	Probability sampling; Self-administered interview	University students (GP)	M: 399 F: 551	M&F; 15-30	M: 25.0¥ F: 42.1¥	Ever practiced	X	X	high risk of bias
Mpofu et al 2006	South Africa	Cross-sectional	Probability sampling; Face-to-face interview	Adolescents & Adults in schools/community (GP)	630	M&F; 11-29	X	X	9.7	Ever practiced	high risk of bias
Schwandt et al 2006	Kenya	Cross-sectional	Probability sampling; Face-to-face interview	FSW (KAP)	236	F; 15-63	X	X	40.8	X	Ever practiced	low risk of bias
Jaspan et al 2007	South Africa	Cross-sectional	Convenience sampling; Self-administered & PDA interview	Adolescents in schools/community (GP)	212	M & F: 11-19	X	X	x	Paper: 2.4; PDA: 3.8	Ever practiced	low risk of bias
Operario et al 2007	South Africa	Cross-sectional	Probability sampling; Face-to-face interview	Adolescent & adult in community (GP)	11904	M & F: 15-24	F: 8.9 vs 11.4; M: 10.4 vs 10.3	Ever practiced	3.1 vs 3.8	3.4 vs 3.1	Ever practiced	low risk of bias
Allen et al 2007	Tanzania	Cohort	Probability sampling; Face-to-face interview & Self-administered interview	Women working in food & recreational facilities (KAP)	150	F; NS	X	X	FFI: 1.4; Diary: 2.1	X	Past 1 month	high risk of bias
Watson-Jones et al 2007	Tanzania	RCT	Venue based sampling; Face-to-face interview	Women working in food & recreational facilities (KAP)	2719	F; 16-35	X	X	2.4	X	Ever practiced	low risk of bias

Bing et al 2008	Angola	Case control	Probability sampling; Face-to-face interview	Adult in community (KAP)	568	M:18-51	X	X	X	X	< 20.0	Ever practiced	low risk of bias
Cornman et al 2008	South Africa	RCT	Convenience sampling; Self-administered interview	HIV positive men & women (KAP)	152	M&F; 18-58	11.0		Past 3 months	F: 27.0	M: 28.3	Past 3 months	high risk of bias
Grijsen et al 2008	Kenya	Cross-sectional	Volunteer sampling; Face-to-face interview	HIV positive men & women (KAP)	361	F; 23-33	X		X	F: 18.0	X	Past 3 months	low risk of bias
Skoler-Karpoff et al 2008	South Africa	RCT	Venue-based sampling; Self-administered interview	Adolescent & adults in schools/community (GP)	6202	F: ≥ 16	8.0		Past 3months	2.0	X	Past 3months	low risk of bias
Morhason-Bello et al 2008	Nigeria	Cross-sectional	Probability sampling; Self-administered interview	Adolescents & Adults in schools/community (GP)	695	M&F; 12-24	47.2		Ever practiced	15.2		Ever practiced	high risk of bias
Pluddeman n et al 2008	South Africa	Cross-sectional	Probability sampling; Audio computer assisted self-interview	Adolescents in schools/community (GP)	M: 2041 F: 2433	M&F; 12-14	M: 26.2 F: 8.1		Ever practiced	F: 7.1	M: 23.3	Ever practiced	high risk of bias
Adoga et al 2009	Nigeria	Cross-sectional	Volunteer sampling; Self-administered interview	Adult in community (KAP)	M: 300	M: Mean 29.2	X	X	X	X	M: 11.7	Ever practiced	low risk of bias
Andersson et al 2009	South Africa	Cross-sectional	Volunteer sampling;	Adolescent & adult in	Anal sex: 358; Oral sex: 141	M&F: 18-60	steady: 40		Past 6 months	steady: 6.2		Past 6 months	high risk of bias

			Face-to-face interview	community (GP)	Oral sex:357; Anal sex:141		causal: 32.9		casual: 9.2			
Bamidele et al 2009	Nigeria	Cross-sectional	Probability sampling; Self-administered interview	Adolescents in schools/community (GP)	521	M&F; 10-19	13.3	Ever practiced	12.4		Ever practiced	high risk of bias
Kalichman et al 2009	South Africa	Cross-sectional	Venue based sampling; Self-administered interview	Adult men & women in community/ clinics (KAP)	M: 2593 F: 1818	M&F; Mean age: 30	X	X	F: 10.0	M: 14.0	Past 3 months	low risk of bias
Kazaura et al 2009	Tanzania	Cross-sectional	Probability sampling; Self-administered interview	Adolescents in schools/community (GP)	885	M&F; 10-19	M: 9.4 F: 5.8	Ever practiced	F: 5.4	M: 8.5	Ever practiced	high risk of bias
van der Elst et al 2009	Kenya	Cohort	Probability sampling; Audio computer assisted and face-to-face interview	Adult women in community (GP)	139	F: Median age 28	X	X	X	ACASI: 39.6; FtFI:43.9	X	Ever practiced	low risk of bias
Ambaw et a 2010	Ethiopia	Mixed methods	Probability sampling; Self-administered interview	University students (GP)	Oral sex:1945; Anal sex:1921	M&F: 17-45	M: 9.8; F: 6.3	Ever practiced	M: 4.6; F: 2.9		Ever practiced	low risk of bias
Opoku 2010	Ghana	Cross-sectional	Venue based sampling; Not reported	Women working in food & recreational facilities (KAP)	1143	F; 18-35	42.3	Ever practiced	11.5		Ever practiced	high risk of bias

Abdool karim et al 2010	South Africa	RCT	Volunteer sampling; Self-administered interview	Adolescent & adult women in community/ clinic (GP)	Rural:611 & Urban:278	F:18-40	X	X	X	Rural: 0.5; Urban: 0.4	X	Past month	high risk of bias
Abdool karim et al 2011	South Africa	Cohort	Volunteer sampling; Face-to-face interview	Adolescent & adult women in community (GP)	Rural: 477: Urban: 117	F:14-30	X	X	X	Rural: 0.8; Urban: 6.8	X	Past month	low risk of bias
Kalichman et al 2011	South Africa	Cross-sectional	Volunteer sampling; Self-administered interview	Men & women attending bars/nightclubs (KAP)	M: 3372 F: 1573	M&F; ≥18	X		X	F: 11.0	M: 15.0	Past 1 month	low risk of bias
Mensch et al 2011	South Africa	RCT	Venue-based sampling; ACASI &Face-to-face interview	Adult women in community/ clinic (GP)	ACASI: 275; FTFI: 274	18-40	X	X	X	ACASI: 7.8; FtFI: 1.9	X	Past month	low risk of bias
Nel et al 2011	South Africa	Cross-sectional	Venue-based sampling; Face-to-face interview	Adolescents & adults in schools/community (GP)	Madibeng: 798; Mbekweni:800	F: 18-35	Madibeng:12.9; Mbekweni:8.6		Ever practiced	Madbeng:1.9; Mbekweni:1.5	X	Ever practiced	low risk of bias
Maswanya et al 2011	Tanzania	Cross-sectional	Probability sampling; Face-to-face interview	Adolescents & Adults in schools/community (GP)	247	F; 18-24	38.5		Ever practiced	34.8	X	Ever practiced	high risk of bias
Priddy et al 2011	Kenya	Cross-sectional	Convenience sampling; Face-to-face interview	FSW (KAP)	200	F; 18-60	X		X	37.8	X	Ever practiced	high risk of bias
Veldhuijezn et al 2011	Kenya & Rwanda	Mixed methods	Snow ball sampling;	FSW (KAP)	Kigali: 800	Kig: F; 22-30	X	X	x		X	Past 3 months	low risk of bias

			Face-to-face interview		Momb:820	Mom: F; 24-36				Kig: 5.5 Mom:4.3			
Venkatesh et al 2011	South Africa & Zimbabwe	RCT	Venue based sampling; Audio computer assisted self-interview	HIV positive men & women (KAP)	327	F; 18-49	X	X	X	4.8	X	Past 3 months	low risk of bias
Chege et al 2012	Kenya	Cohort	Convenience sampling; Audio computer assisted self-interview	Adult men & women in community (GP)	M: 347	M&F; 18-34	M: 29.0		Past 3 months	F: 21.0	M: 25.0	Past 3 months	high risk of bias
					F: 278		F: 21.0						
Cherie et al 2012	Ethiopia	Cross-sectional	Probability sampling; Self-administered interview	Adolescents & Adults in schools/community (GP)	3840	M&F; 15-24	5.4		Ever practiced	4.3		Ever practiced	low risk of bias
							51.6		Past 12 months	57.1		Past 12 months	
Guedou et al 2012	South Africa, Uganda, Benin	Cross-sectional	Probability sampling; Face-to-face interview	FSW (KAP)	1367	F: >18	8.3		Past 1 month	2.2	X	Past 1 month	low risk of bias
Loggerenberg et al 2012	South Africa	Cohort	Convenience sampling; Self administered interview	HIV positive women (KAP)	245	F: >=18	13.9		Ever practiced	17.1	X	Ever practiced	high risk of bias
Clain et al 2012	South Africa	Cross-sectional	Probability sampling; Self administered interview	Adolescent & adult in community (KAP)	M:981; F:492	M&F >=18	X	X	X	6.9	10.6	Past month	low risk of bias
Peltzer 2012	South Africa	Case control	Convenience sampling; Face-to-face interview	HIV positive men & women (KAP)	2255	M&F; ≥18	13.4		Past 3 months	7.7		Past 3 months	high risk of bias

Essomba et al 2013	Cameroun	Cross-sectional	Convenience sampling; Face-to-face interview	FSW (KAP)	112	F:20-29	X	X	X	20.5	X	Ever practiced	low risk of bias
Gevers et al 2013	South Africa	Cross-sectional	Probability sampling; Audio computer assisted self-interview	Adolescents in schools/community (GP)	M: 190 F: 82	M&F; 12-15	M: 19.5; F: 11.8		Ever practiced	F: 1.4	M: 10.5	Ever practiced	low risk of bias
							M: 4.8; F: 2.8		Past 3 months	F: 1.1	M: 7.4	Past 3 months	
Kakoko 2013	Tanzania	Cross-sectional	Probability sampling; Self-administered interview	Adolescents in schools/community (GP)	3187	M&F; 12-14	4.4		Ever practiced	6.4		Ever practiced	low risk of bias
Lambdin et al 2013	Tanzania	Cross-sectional	Venue based sampling; Self-administered interview	Adult men & women in community/ clinics (KAP)	M: 1698 F: 153	M: Mean age: 31; F: Mean age 29	X	X	X	24	7	Past 12 months	low risk of bias
Scott-Sheldon et al 2013	South Africa	Cross-sectional	Snow ball sampling; Self-administered interview	Men attending bars/nightclubs (KAP)	820	M; ≥18	X		X	X	25.4	Ever practiced	low risk of bias
Vogt et al 2013	South Africa	Cross-sectional	Convenience sampling; Self-administered interview	Adult men & women in community/ clinics (KAP)	68	M&F; 28-36	M: 79.4		Ever practiced	X		X	high risk of bias
							F: 76.5						
Gaffoor et al 2013	South Africa	RCT	Volunteer sampling; Face-to-face interview	Adult women in community (GP)	1485	F: >=18	19.9		Past 3 months	5.6	X	Past 3months	low risk of bias
Gray 2013	South Africa	RCT	Volunteer sampling; Face-to-face interview	Adult men & women in community (GP)	M: 441; F:360	M & F: 18-35	X	X	X	2.5	2.7	Past 6 months	high risk of bias

Asekun-Olarinmoye et al 2014	Nigeria	Cross-sectional	Probability sampling; Self-administered interview	University students (GP)	226	M&F: Mean age: 23.6	16.4		Ever practiced	4.4		Ever practiced	High risk of bias
Jemmott et al 2014	South Africa	RCT	Probability sampling; ACASI	Adolescents & adults in schools/community (GP)	1181	M: 18-45	X	X	x	X	Steady: 11.3; Casual: 7.7	Ever practiced	low risk of bias
Guffey et al 2014	South Africa	RCT	Venue-based sampling; Face-to-face interview	Adolescent & adult women in schools/community(GP)	3087	F: >=18	X	X	X	5	X	Ever practiced	low risk of bias
Davidson et al 2014	South Africa	Cross-sectional	Volunteer sampling; Face-to-face interview	Adult men in the community (GP)	125	M; 17-64	40.8		Ever practiced	X		X	high risk of bias
Folayan et al 2014	Nigeria	Cross-sectional	Probability sampling; Face-to-face interview	Adolescents in schools/community (KAP)	357	M&F; 10-19	26. 6		Ever practiced	6.7		Ever practiced	low risk of bias
							M: 15.1; F: 23.3		Last sexual act	F: 3.4	M: 5.6	Last sexual act	
Githuka et al 2014	Kenya	Cross-sectional	Probability sampling; Face-to-face interview	Adult women in community (KAP)	118	F: Median age 30.3	X	X	X	31.4	X	Ever practiced	low risk of bias
Kerwin et al 2014	Malawi	Cross-sectional	Probability sampling; Face-to-face interview	Adult men in community (GP &KAP)	2753	M; 18-30	1.7-11.7		Ever practiced	X		X	low risk of bias
Mbulawa et al 2014	South Africa	Cross-sectional	Venue-based sampling; Face-to-face interview	Adult men & women in community/ clinic (GP)	221	M: Mean age 38; F: Mean age 34	M: 6.2; F: 8.7		Past 6 months	X	X	X	high risk of bias

Meque et al 2014	Mozambique	Cohort	Probability sampling; Face-to-face interview	Adult women in community (GP)	411	F; 18-35	7.4		Ever practiced	X		X	low risk of bias
Thurston et al 2014	South Africa	Cross-sectional	Convenience sampling; Face-to-face interview	Adolescent in schools/community (GP)	818	F:16-18	X	X	X	5	X	Ever practiced	high risk of bias
Anyanwu et al 2015	Nigeria	Cross-sectional	Convenience sampling; Self-administered interview	Adolescent & adult in community (GP)	102	F: 16-29	X	X	X	46.5	X	Ever practiced	high risk of bias
Noguchi et al 2015	South Africa	RCT	Volunteer sampling; ACASI	Adult women in community (GP)	3141	F: 21-27	X	X	X	20.3	X	Past 3months	low risk of bias
Palanee-Phillips et al 2015	Malawi; South Africa; Uganda & Zimbabwe	RCT	Volunteer sampling; Face-to-face interview	Adolescent & adult in schools/community (GP)	Mal:272; SA:1426; Ugan: 253; Zimb:678	F:18-45	X	X	X	Mal:1.0 : SA: 3.0; Ugan:2.0: Zim:1.0	X	Past 3months	low risk of bias
Animasahun et al 2016	Nigeria	Cross-sectional	Probability sampling; Self-administered interview	Adolescents in schools/community (GP)	19	F: 10-19	5.3		Ever practiced	X	X	X	low risk of bias
Arulogun et al 2016	Nigeria	Cross-sectional	Probability sampling; Self-administered interview	Adolescent & adult in community (GP)	270	M: Mean age:21.7; F:Mean age:20.9	43.8		Ever practiced	X	X	X	low risk of bias
Dubbink et al 2016	South Africa	Cross-sectional	Probability sampling; Face-to-face interview	Adult women in community/ clinic (GP)	569	F: 18-49	13.4	X	Past 6 months	4.6	X	Past 6 months	low risk of bias

Lawan et al 2016	Nigeria	Mixed methods	Probability sampling; Face-to-face interview	Adult men & women in community/ clinics (KAP)	160	M&F:18-34	1.5		Ever practiced	72.0		Ever practiced	low risk of bias
Luma et al 2016	Cameroun	Cross-sectional	Convenience sampling; Face-to-face interview	Adult men & women in community/ clinics (KAP)	369	M&F:≥21	X	X	X	5.7		Ever practiced	high risk of bias
McLellan-Lemal et al 2016	Kenya	Cohort	Convenience sampling; Audio computer assisted self-interview	Adult women in community (GP)	463	F: 18-35	X	X	X	7.3	X	Past 12 months	low risk of bias
Teasdale et al 2016	South Africa & Zimbabwe	Cross-sectional	Probability sampling; Audio computer assisted self-interview	Adult women in community (GP)	2540	F: 18-45	X	X	X	5.4	X	Last sexual act	low risk of bias
Dareng et al 2017	Nigeria	Cohort	Probability sampling; Face-to-face interview	Adult women in community (GP)	725	>=18	3	4.6	Ever practiced	0.7	X	Ever practiced	low risk of bias
Giorgio et al 2017	Nigeria	Cross-sectional	Snow ball Sampling; Face-to-face interview	Adolescent & adult in community (KAP)	935	F:16-39	X	X	X	13.4	X	Ever practiced	low risk of bias
Hladik et al 2017	Uganda	Cross-sectional	Snow ball Sampling; Audio computer assisted self-interview	FSW (KAP)	942	F≥15	X	X	X	13.6	X	Ever practiced	low risk of bias

Longo et al 2017	Central African Republic	Cross-sectional	Venue-based sampling; Face-to-face interview	FSW (KAP)	345	F: Median age 23	X	X	X	24.0	X	Last sexual act	low risk of bias
Shayo et al 2017	Tanzania	Mixed methods	Probability sampling; Face-to-face interview	Adolescent & adult in community (KAP & GP)	903	M&F:≥15	X	X	X	18.5		Past 12 months	low risk of bias
Chikandiwa et al 2018	South Africa	Cohort	Probability sampling; Audio computer assisted self-interview	Adult men in community (KAP)	181	23-62	15.0		Ever practiced	X	X	X	low risk of bias
Davey et al 2018	South Africa	Cross-sectional	Probability sampling; Face-to-face interview	Adult women in community (GP)	376	≥18	21	22.8	Past 12 months	8.0	X	Past 12 months	low risk of bias
Maheu-Giroux et al 2018	Côte d' Ivoire	Cross-sectional	Snow ball sampling; Face-to-face interview	FSW (KAP)	466	≥18	X	X	X	24.0	X	Past 12 months	low risk of bias
Ybarra et al 2018	South Africa	Cross-sectional	Probability sampling; Face-to-face interview	Adolescent & adult in community (GP)	937	16-24	M:34.7; F:18.3		Ever practiced	10.9	31.3	Ever practiced	low risk of bias

The majority of the studies (90 out of 103) focused on participants aged 10 to 49 years (Supplementary table 1). Eleven out of 91 studies included only adolescents (aged ≤19 years)[175, 242, 247, 248, 254-256, 327]. Seven studies did not indicate the study population age [237, 281, 300-302]. Overall, 46 studies included both male and females [174-176, 237, 239-248, 251-256, 259, 264-266, 268, 270, 273, 278, 280, 284, 287, 292, 294, 301, 302, 311, 314, 320, 326-329, 334], 51 studies included women/girls only [238, 249, 250, 257, 258, 260-263, 267, 269, 271, 272, 274, 276, 277, 279, 281-283, 285-291, 296-299, 305, 306, 309, 310, 312, 313, 315-319, 321, 332, 333, 335], and eight studies included men/boys only [275, 293, 295, 307, 308, 330, 331, 336].

Reported condom use during heterosexual oral and anal sex

Condom use was reported in 19 studies during heterosexual anal sex [240, 241, 252, 253, 256, 259, 261, 262, 273, 275, 277, 279, 284, 287, 290, 306, 312, 313, 315, 320], five studies during oral sex [240, 252, 253, 256, 261], and 29 studies for combined vaginal, oral and anal sexual experience [175, 242, 254, 257, 258, 260, 262, 263, 265, 267-269, 276, 280, 282, 285, 288, 292, 297, 298, 305, 307, 311, 316-319, 335]. (***Table 2.2***).

Four (three from South Africa and one from East Africa) out of six studies that reported condomless anal sex were among key affected populations[253, 277, 287, 290], and one study was a general population study in South Africa[277]. Condomless oral sex was also reported in a study among HIV positive men and women in South Africa[253]. Reported condom use tended to be higher during heterosexual anal sex than during oral sex, and was more frequently reported among key affected populations than general populations during heterosexual anal sex. The range of any condom use during oral sex was 1.7-16.5% among three general population studies [240, 252, 256]. Of these, consistent condom use during oral sex was reported by 13.2% of Nigerian and 16.5% of Zimbabwean students [240], and by 12.2% of high school students in Ethiopia [252]. A study in South Africa showed that 54.8% of FSWs reported consistent condom use during oral sex [261].

The range of any condom use during heterosexual anal sex was 6.7-73.1% among eight general population studies [240, 241, 252, 256, 259, 273, 277, 320]. Consistent condom use during anal sex was reported by 22.5% and 27.5% of Nigerian and Zimbabwean students

respectively [240], 26.1% of Ethiopian high school students [252] and 36.4% of adolescents and young adults in Tanzania[320]. Among five key affected population studies, the range of condom use during heterosexual anal sex was 13.2.0-67.0% [261, 275, 279, 284, 312]. Two of these studies reported consistent condom use of 45.0% among Kenyan FSWs with their clients [279] and 50% among HIV positive women in a South African city [261]. The range of condomless heterosexual anal sex among four key affected population studies was 7.0-54.3% [253, 279, 287, 290].

Prevalence of reported oral sex

Only six (two from South Africa and one each from Nigeria, Rwanda, Zambia and Zimbabwe) out of the 51 oral sex studies described the prevalence of reported oral sex as either giving or receiving oral sex [238, 239, 241, 269, 271, 272]. Most studies that reported on prevalence of oral sex were from the South African region, among adolescents and young adults, and key affected populations (***Figure 2.2 and Table 2.1***).

Reported prevalence of ever practiced oral sex

Twenty-eight general population studies reported on the prevalence of ever practising oral sex (***Table 2.1***), of which only two studies (Nigeria and Zambia) described the prevalence of giving and receiving oral sex separately[241, 271]. However, the Zambian study combined these data by gender[241]. Of the remaining 26 general population studies reporting oral sex prevalence, 14 described this by gender: five among adolescents and adults [250, 263, 265, 273, 326]; four among adolescents[247, 248, 254, 335]; two studies among adult women [260, 332]; two studies among university students [243, 266]; and one study among adult men only [330]. Men/boys tended to report a higher prevalence of ever practising oral sex compared to women/girls across these populations. For example, 26.2% of boys reported ever practising oral sex compared to 8.1% of girls in a cross-sectional study in South Africa[247], and 22.8% of males reported ever practising oral sex compared to 18.2% of female South African university students [243]. The range of reported oral sex prevalence in the remaining studies was 5.0-46.4% among university students[237, 240, 264, 268]; 1.7-26.6% among adolescents[175, 255, 256, 327]; 3.0-47.2% among a combined population of adolescents and adults [174, 176, 252, 328], and 1.7-40.8% in three studies among adult populations [330-332]. In all but adult populations, higher prevalences of ever practicing oral sex were recorded after the year 2000 compared to before 2000. Studies conducted among

university students reported a relatively high prevalence of oral sex compared with other groups within the general population.

Ten studies amongst key affected populations described the prevalence of ever practising oral sex [238, 244, 249, 257, 261, 270, 329, 331, 333, 336]. Three studies were among FSWs, of which only one Rwandan study described prevalence of giving and receiving oral sex separately[238, 257, 333]. The Rwandan study showed that 1.8% and 0.5% of FSWs reported that they ever received or gave oral sex respectively[238]. Prevalence of having ever practiced oral sex in the other two studies among FSWs were 9.0% in Kenya [333] and 24.1% in South Africa[257]. The prevalences of ever having practiced oral sex in two Nigerian studies were reported to be 1.5% among adult men and women in the general community [270] and 13.3% among HIV positive men and women [244]. In Ghana, 42.3% of 'women considered to be at risk of STIs' (working in food and recreational facilities) ever practiced oral sex[249]. Three studies from South Africa reported on the prevalence of ever practising oral sex among key affected populations[261, 329, 336]. One study showed that a higher proportion of HIV positive men (79.4%) in the community/clinic reported ever practising oral sex than HIV positive women (76.5%)[329] while the two other studies reported that the prevalence of ever having practiced oral sex was 13.9%[257] among HIV positive women [261] and 15.0% among HIV positive adult men [336] in the community.

Prevalence of oral sex by other reporting periods

Data on the prevalence of oral sex using other reporting periods came from 11 general population studies [242, 251, 252, 254, 256, 258, 259, 262, 269, 272, 334]. Three of these studies found that men/boys generally reported a higher prevalence of oral sex than women/girls. For example, any oral sex in the past three months was reported by 29.0% and 21.0% of 18-34 year old Kenyan men and women respectively [251], and by 4.8% and 2.8% of 12-15 year old South African boys and girls respectively [254]. In contrast, a Tanzanian study showed that having had oral sex during their first sexual experience was reported by 39.0% and 40.0% of primary school boys and girls, respectively[242]. Among a combined population of adolescents and adults in Addis Ababa, the prevalence of reported oral sex in the past 12 months among the 5.4% of the study population that had ever practiced oral sex was 51.6% [252]. Two South African studies reported the prevalence of oral sex in the past three months as 8.0% among girls/women above 16 years[258] and 19.9% among women aged 18 years

and above[262]. Reported prevalence of oral sex in the past six months ranged between 32.9% and 40.0% among adult men and women with their casual and steady partners, respectively in Soweto[259], 13.4% among women in rural Mopani District[269], and 6.2% of men and 8.7% of women in Cape Town[334]. Finally, 22.8% and 21.0% of pregnant and postpartum women in Cape Town described either giving or receiving oral sex in the past 12 months respectively [272].

Among four key affected population studies, two studies among HIV positive men and women described the prevalence of reported oral sex in the past three months to be 11.0% in KwaZulu-Natal and 13.4% in Mpumalanga in South Africa [246, 253]. A third study among FSWs and their clients in Harare, Zimbabwe, described higher reporting by men of receiving oral sex from FSWs during their last sexual act than by FSWs giving oral sex during their last sexual encounters (10.0% vs 1.0%)[239]. In the same study, 4.0% and 1.0% of men and FSWs respectively reported giving/receiving oral sex during their last sexual act [239]. Another study among FSWs from South Africa, Uganda and Benin reported that the prevalence of oral sex in the past month with clients was 8.3% [267].

Factors associated with engaging in oral sex

Eight studies investigated factors associated with reported oral sex (***Table 2.3***). Five of these studies reported unadjusted estimates [248, 251, 254, 256, 333]. In 2000, a study in Kenya found that older FSWs were less likely to have ever engaged in oral sex than younger FSW [333]. In 2012, another study in Kenya showed that men tended to report oral sex in the past 3 months more than women (29.0% vs 21.0%) [251]. Similarly, adolescent boys in Tanzania were more likely to report ever practicing oral sex compared with adolescent girls (9.4% vs 5.8%) [248]. In Nigeria, girls were more likely to report oral sex as their last sexual act compared with boys (23.5% vs 15.1%)[256]. Girls in South Africa aged 12-15 years who were "currently dating" compared to girls that were not currently dating were more likely to have reported ever having oral sex with their partners (8.1% versus 0.6%) and also having oral sex in the last three months (6.5% versus 0%,) [254]. Similar results on dating status were also reported among boys (20.2% versus 8.1%)[254].

Two studies from Ethiopia and a study from Malawi reported adjusted estimates for the association between potential risk factors and reported oral sex [252, 266, 331]. A study

among 3543 adolescents in high schools in Ethiopia showed that reporting oral sex was associated with having an illiterate mother, being younger (15-16 years compared to 17 years and older), being female, having a perception of oral sexual activity in peers, having a positive attitude to oral sex, and low self-esteem [252]. Of the 5.4% who reported ever having had oral sex, 13.5% had initiated oral sex before the age of 10 years [252]. Another Ethiopian study found that among university students, ever having practised oral sex was associated with: the male gender; being a first year undergraduate; being a student in faculties of business and economics, technology, humanities, social sciences and education; living off campus; belonging to the Protestant Christian denomination; and having boy/girlfriends[266]. A study among Malawian men that reported ever practicing oral sex had three times the odds of ever using condoms, two times odds of spending money in the last three months, and having a higher number of lifetime sexual partners than men with no history of oral sex [331].

Motivations for engaging in oral sex

Only one study reported on motivations for engaging in oral sex. This study was conducted among Ethiopian school boys and girls aged 15-24 years in Addis Ababa [252]. The main motivations reported by participants were preventing pregnancy (95.9%), minimizing risk of HIV acquisition (86.5%), preserving virginity (85.8%) and reducing the risk of STIs (80.4%). Of those having oral sex within the past 12 months, 48.0% had received a gift in exchange for practising oral sex.

Prevalence of reported heterosexual anal sex

Sixty-five out of 82 studies distinguished the prevalence of reported anal sex into 'insertive' by male participants or 'receptive' by female participants[238, 239, 242, 243, 246-251, 254, 256-258, 260-267, 269, 271-277, 279-299, 305-313, 315-319, 321]. Most studies that described anal sex were from Southern and East African countries, among adolescents and young adults, and key affected populations (***Figure 2.3 and Table 2.1***). We used the same reporting periods as we did for oral sex in presenting prevalences of heterosexual anal sex in different populations.

Reported prevalence of ever practiced heterosexual anal sex

Fifty-one out of 82 studies reported on the prevalence of ever practising heterosexual anal sex. Twenty-three out of 51 studies were conducted among key affected populations [238,

244, 249, 257, 261, 270, 274-276, 279, 282, 289, 293, 305-308, 310, 312, 314, 317, 318]. Seventeen of the 28 general population studies described reported prevalence of receptive or insertive heterosexual anal sex separately [243, 247, 248, 250, 254, 260, 263-266, 271, 273, 295-297, 309, 313]. Of these, seven studies were among adolescents and adults[250, 260, 265, 273, 295, 296, 313], five studies were conducted among adolescents only in schools/communities (South Africa [247, 254, 297], Tanzania[248] and Mozambique[263]), three studies among university students in South Africa [243, 264, 266] and two studies among adult women[271, 309]. In seven studies, the proportion of boys that reported ever-practising heterosexual insertive anal sex was higher than the proportion of girls that reported ever engaging in receptive anal sex [243, 247, 248, 254, 265, 266, 273]. For example, in Tanzania, 8.5% and 5.4% of boys and girls reported ever having insertive or receptive anal sex, respectively [248]. In South Africa, 10.8% and 8.4% of male and female university students reported ever engaging in insertive or receptive anal sex, respectively [243]. In the three studies that were conducted among girls/women only, the reported prevalence of receptive anal sex among adolescents and adults was 34.8% in Tanzania[250] and 7.7-11.3% in South Africa[295], and in a study from South Africa a prevalence of 1.5-1.9% was reported among adult women[260].

In the remaining 11 general population studies that reported the prevalence of ever having practiced anal sex among boys/men and girls/women, three were among university students [237, 240, 268] and four studies each were among adolescents and adults in schools/community [174, 241, 252, 278] or adolescents in schools [175, 255, 256, 280]. The reported prevalence of ever practising anal sex among university students in Nigeria ranged between 0.3-4.4% [237, 268]. In another similar study, 35.2% among university students in Zimbabwe, and 46.4% among university students in Nigeria reported ever practising anal sex [240]. Studies that combined adolescent and adult populations reported prevalences between 4.3-34.8% from Zambia, South Africa, Nigeria and Ethiopia [174, 241, 252, 278]. Studies amongst adolescents in schools/communities showed that the prevalence of ever practicing anal sex was 6.7-12.4% in Nigeria[175, 256], 2.4-3.8% in South Africa[280] and 6.4% in Tanzania[255].

In key affected populations, the reported prevalence of ever practising receptive heterosexual anal sex in nine different studies among FSWs was 2.3-42.8% in Rwanda[238],

Cameroun[310], Uganda[318], Kenya[274, 279, 289] and South Africa[257, 276, 306]; 42.0% among male truck drivers in South Africa[275]; 25.4% among men attending bars/night clubs in South Africa [293]; 11.5% [249], 2.4% [282] and 0.4% [305] among women working in food and recreational facilities in Ghana, Tanzania and Kenya respectively. Other reported prevalences of anal sex were 3.3-17.1% among HIV positive men and women in Nigeria [244] and South Africa[261], 5.7-72.0% among adult men and women in community/clinics in Nigeria[270] and Cameroun[314], 11.7-20.0% among adult men only in Nigeria[308] and Angola[307], and 13.4% among adolescents and adults women in South Africa[317].

Prevalence of heterosexual anal sex by other reporting periods

Six key affected population studies reported specifically on insertive or receptive anal sex within the past three months [246, 253, 283, 284, 290, 291]. Higher prevalences of insertive anal sex in the past three months were reported by men compared to receptive anal sex reported by women among key affected populations [246, 284]. Similarly, two key affected population studies in South Africa (one study each among HIV positive men and women[246] and adult men and women[284]) showed higher prevalences among men that reported practising insertive anal than women that engaged in receptive anal sex. Three other studies among HIV positive men and women in Kenya, South Africa and Zimbabwe described the prevalence of heterosexual anal sex in the past three months to be 18.0%[283], 7.7%[253] and 4.8%[291] respectively.

Four studies among key affected populations presented prevalences of anal sex in the past month [267, 281, 287, 292]. One study compared prevalences of anal sex in the past month by method of data collection and found that women in food and recreational centres in Tanzania reported a higher prevalence of anal sex using daily diaries (2.1%) to record their sexual behaviours compared to face-to-face interviews (1.4%) [281]. The other two studies from South Africa reported the prevalence of insertive anal sex in the past month among men attending bars/night clubs and men patronising alcohol drinking points to be 15.0% [287] and 10.6% respectively[292]. In the same studies, 11.0% of women in bars/night clubs[287] and 6.9% women at alcohol drinking points reported receiving anal sex in the past month[292]. Another study reported that 2.2% of FSWs in South Africa, Uganda and republic of Benin received anal sex in the past month [267]. Other reporting periods used to describe prevalence for anal sex among key affected populations were the past 12 months in 3 studies

(two from Tanzania and Cote-d'ivoire)[311, 320, 321], and during the most recent sexual acts in 2 studies from Zimbabwe[239] and the Central African Republic [319].

Seven general population studies, including six from South Africa, reported on insertive or receptive anal sex in the past three months[251, 254, 258, 262, 277, 298, 299]. The range of reported prevalence of receptive anal sex in three studies among South African women was 5.6-20.3%[262, 277, 298]. Two studies among adolescents and adults reported a prevalence of 2-3.0%[258, 299]. In the same country, a study showed that 1.1% of girls reported receptive anal sex while 7.4% of boys reported insertive anal sex during the same period[254]. A Kenyan study showed that 25.0% men reported insertive anal sex while 21.0% women reported receptive anal sex in the preceding three months[251].

Twelve studies used different reporting periods (past 12 months[252, 272, 315], past six months[259, 269, 294], past month[285, 286, 288], during first sexual act[242] and last sexual act [256, 316]) . Within these reporting periods, the highest reported prevalence of anal sex was 57.1% among anal sex experienced Ethiopian high school students in the past 12 months[252], 9.2% among South African young men and women in the past six months[259], 7.8% of South African adult women in the past month[288] and 5.6% of Nigerian boys during their last sexual act [256].

Factors associated with engaging in anal sex

Eight studies explored factors associated with practising heterosexual anal sex (***Table 2.3***). Two of the three studies that presented unadjusted estimates showed that the reported prevalence of heterosexual anal sex was associated with type of sexual relationship [254, 289]. A study amongst South African adolescents found that the prevalence of having ever practised heterosexual anal sex was higher among 'currently dating' girls (3.3% vs 0%) and boys (15.6% vs 6.0%) than those with 'no dating partners'[254]. A similar result was also described in the same study among boys that reported prevalence of anal sex act in the past three months[254]. In Kenya the frequency of anal sex in past month among FSWs was higher among those with regular and casual partners than those with a primary partner only [289]. In the same study, the frequency of condom use among FSWs was lower during anal sex than during vaginal sex (data not shown). Unlike the general gender pattern observed in other

studies, women in Kenya reported a higher prevalence of heterosexual anal sex than men (25.0% vs 16.0%) [251].

Five studies reported adjusted estimates on factors associated with reported anal sex [252, 266, 284, 287, 290]: A Kenyan study among FSWs showed that the odds of reporting heterosexual anal sex was about four times higher among those with current genital symptoms versus no genital symptoms, three times higher with inconsistent condom use during last sexual act compared to those reporting consistent condom use, two times higher in those with at least five years of sex experience compared to those with more than five years, six times higher with inconsistence condom use with casual partners than those that used condoms, and higher in those with a higher number of sexual partners than those with a lower number [290]. A study among FSWs in Rwanda found that inconsistent condom use with casual sex partners (adjusted odds ratio (AOR)=5.9) and a higher number of sexual partners (AOR=4.3) were also identified as risk factors for reporting heterosexual anal sex [290]. In addition, the odds ratio for those with regular use of alcohol before sex was about three times associated with reporting anal sex than FSWs that those that did not regularly use alcohol before sex. A study among men and women attending bars/night clubs in South Africa found the following factors to be associated with reported anal sex in the past month: younger age, having casual sexual partners compared to regular partners, having sex with only one sexual partner compared to having multiple recent sexual partners, and meeting their sexual partners in *shebeens* (alcohol drinking venues) in the past month [287].

Other risk factors associated with engaging in heterosexual anal sex that were reported among men and women in the community and special treatment clinics in South Africa included the following[284]: never using condoms, previous transactional sex, cannabis use in the past three months, having been previously tested for HIV, and being HIV positive. Being older, married or living with a partner and previous condomless vaginal intercourse reduced the risk of reporting anal sex. Factors associated with ever practising heterosexual anal sex among Ethiopian school boys and girls included younger age, being a boy, having a positive attitude towards anal sex, having low aspirations for college education, having low self-esteem, having a perception of peer engagement in anal sex, and having an illiterate mother or father [252]. However, adolescents living with both parents were less likely to engage in anal sex [252]. In another Ethiopian study, university students reporting ever having had anal

sex experience was associated with enrolment in non-medical university faculties compared with students enrolled in a medical faculty[266]. In the same study, university students that had ever married were more likely to report previous anal sex experience than single students[266].

Motivations for engaging in anal sex

A study in Ethiopia described the motivations for engaging in anal sex among school-attending boys and girls aged 15-24 years [252]. The motivations included minimizing the risk of pregnancy (92.1%), preserving virginity (85.5%), minimising the risk of STIs (82.9%), and minimising risk of acquiring HIV (77.6%). Other motivations reported were desire by the sexual partner, increasing sexual pleasure, and self-preference for anal sex. Amongst the 57.0% who had reported engaging in anal sex in the previous 12 months, 52.3% had received money or gifts for engaging in anal sex.

Four studies (two from Tanzania [303, 304], one from South Africa [300]and one multi-site study from Kenya, Tanzania and Uganda [302]) explored motivations for engaging in anal sex using qualitative research. Their findings showed that motivations differed between men and women (Table 1). Reasons mentioned by women were preserving their virginity, to promote a sexual relationship or to avoid a domestic quarrel, to prevent pregnancy, as an alternative during menstruation or during pregnancy or when there is evidence of a sexually transmitted infection, and in exchange for money[301, 302]. Motivations reported by men included adventure, influence from their peers, to avoid unwanted pregnancy, to enjoy enhanced sexual pleasure and to show sexual supremacy over women [304].

Cultural meaning, interpretations and personal experiences of anal sex

Twelve qualitative studies explored interpretations of anal sex (***Table 2.4***). Five qualitative studies reported on the culture of silence and reluctance to openly discuss heterosexual anal sex [290, 300, 303, 322, 323]. For example, a study in rural South Africa among men and women found that some participants considered heterosexual anal sex to be too sensitive for discussion and some even expressed shock or disappointment and threatened to abandon a focus group discussion when it was brought up for discussion by the facilitator [301]. In the same study, men were reported to be more willing to discuss anal sex than women. In another study in Kenya, men in two counties reported that they were reluctant to discuss anal sex

among themselves as it was regarded as a cultural taboo to claim knowledge of, or practice, anal sex in their community[302].

Two studies (Rwanda and South Africa) reported that women, including FSWs, perceived anal sex as punishment, and they only engaged in it to avoid quarrel from their partners/clients and for financial benefits[290, 300]. Other reasons mentioned by participants for engaging in anal sex included adventure, and coercion [300, 320, 324, 325]. There was some evidence of misunderstanding the definition of anal sex; for example, one South African study reported that participants in rural part of Soweto believed anal sex to mean "penile-vaginal penetration from behind" [300]. In several other studies, interviewees believed that anal sex is "foreign" to the African culture [266, 290, 301] or that it is exclusively practiced by men who have sex with men [301]. Some believed anal sex is safer than penile-vaginal sex [320, 324].

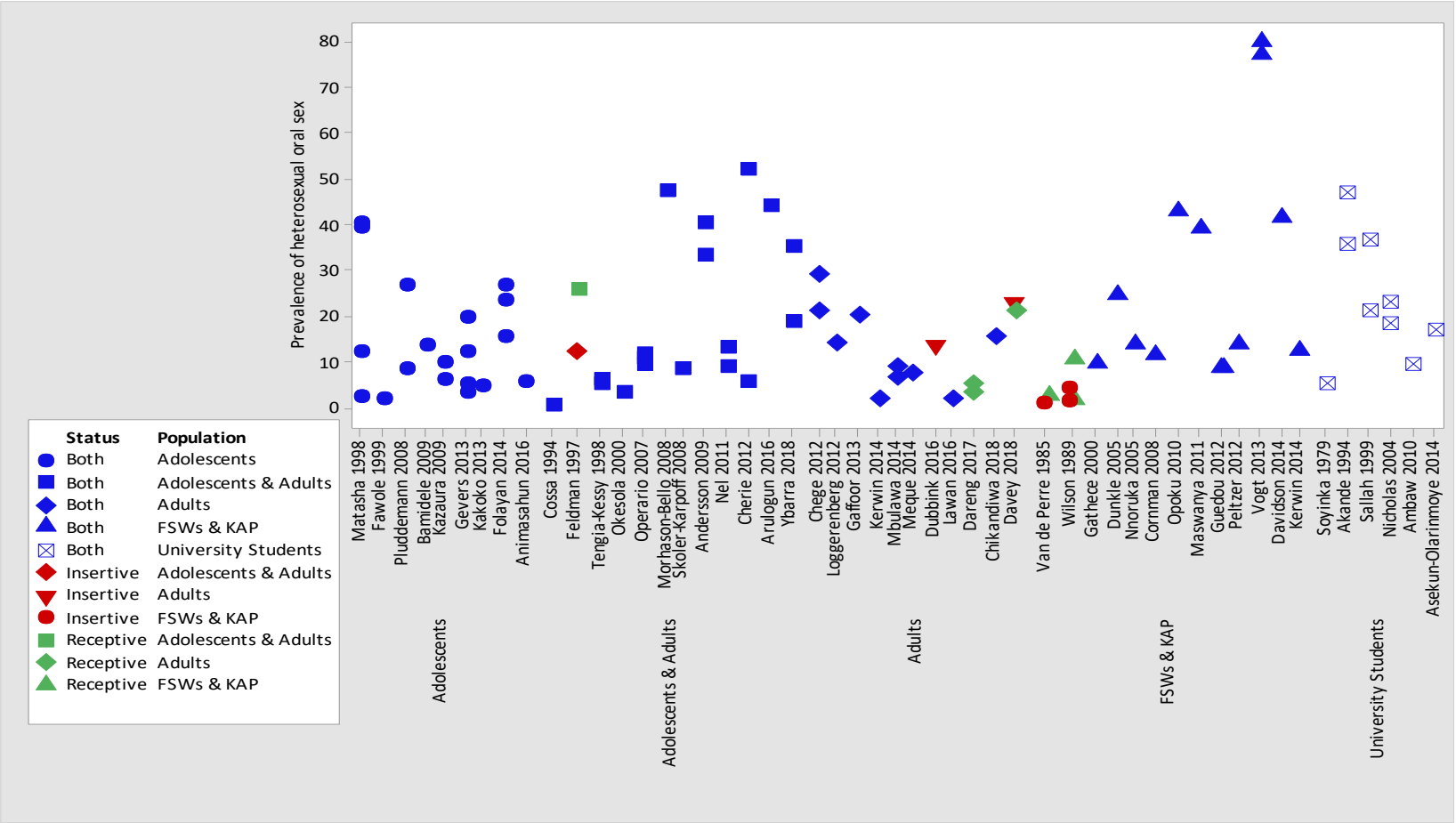
Seven qualitative studies presented personal experiences of men and women about heterosexual anal sex [290, 300, 301, 303, 304, 320, 324]. Findings from three studies showed that men expressed more desire for anal sex than women as they often regarded the act as a sign of manhood, and women were reported not to be receptive to openly discussing or demanding anal sex [300, 303, 324]. Tanzanian and South African studies reported that both men and women sometimes used proxy names such as slang or colloquial terms to describe anal sex [301, 304]. A study among FSWs in Kigali reported extreme resentment towards clients who asked for anal sex as they regarded the practice to be uncomfortable, emotionally painful and associated with STIs and faecal and urinary incontinence[290]. However, some young women in Tanzania said that anal sex was more acceptable and enjoyable when performed with "jelly" lubricants [320].

Assessment of quality of studies

The detailed assessment of risk of bias are presented in ***Table 2.5***. Overall, 53 out of 94 quantitative studies assessed had low risk of bias in their methods: 51 of these described heterosexual anal sex [242, 252, 254-257, 259, 260, 262, 264-267, 269-276, 279, 280, 282-284, 286-288, 290-293, 295, 296, 298, 299, 307-312, 315-321] while 24 studies described oral sex [176, 242, 252, 254-260, 262, 264-267, 269-273, 331, 332, 335, 336]. The majority of articles assessed to be low risk were from Southern and Eastern Africa. Most studies with a high risk of bias used convenience sampling techniques to recruit study participants, had

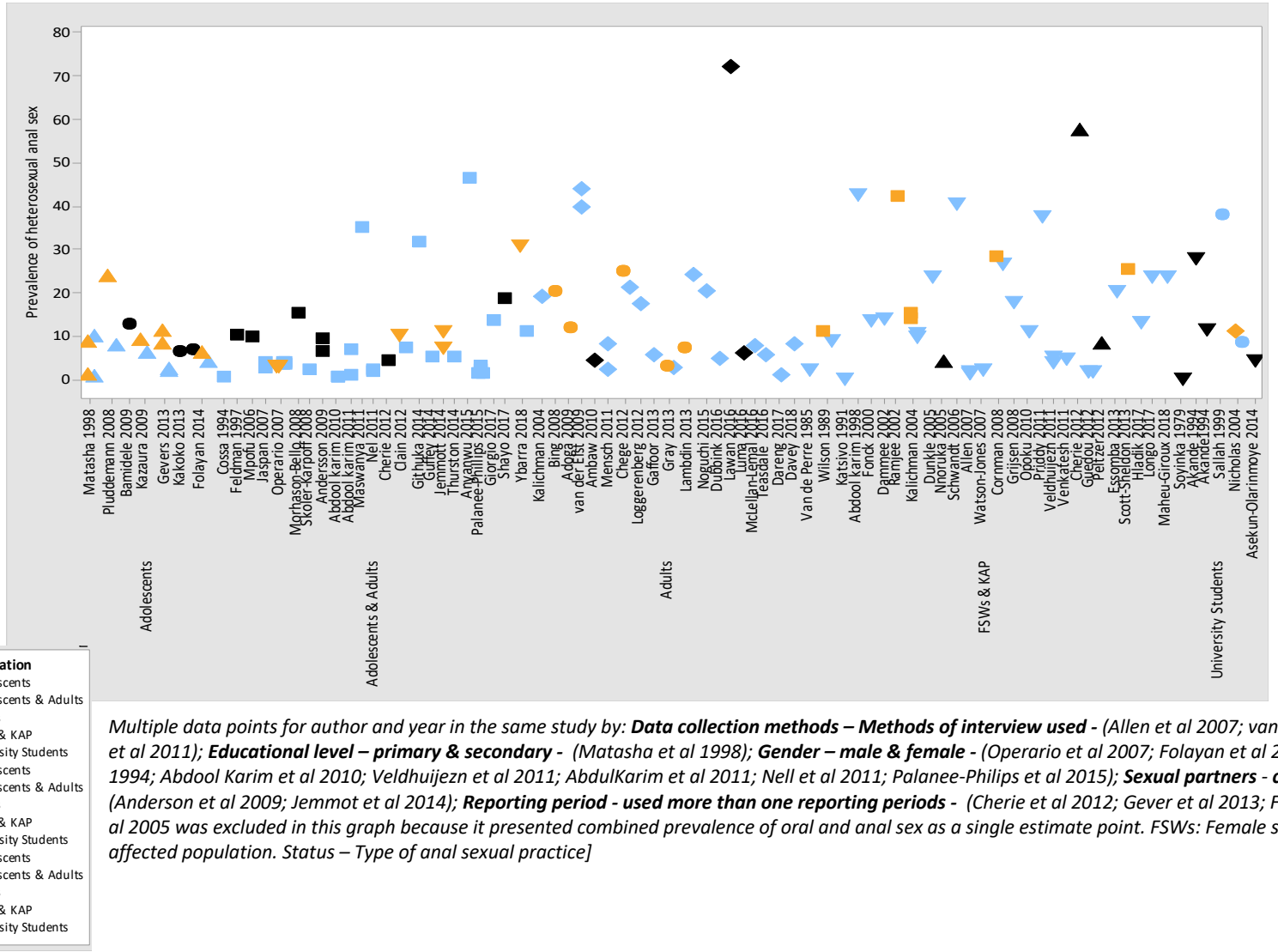
unclear eligibility criteria, did not include operational definitions of outcome measures in the methods, did not control for potential confounders, presented the prevalence of oral or anal sex by the reported sexual behaviour role, or gave no indication as to whether ethical approvals were obtained (data not shown – Supplementary table 3). All of the nine qualitative studies assessed had low risk of bias (Table 2.6).

Figure 2.2: Prevalence of oral sex by study population



Multiple data points for author and year in the same study by: ***Educational level – primary & secondary*** *- (Matasha et al 1998);* ***Gender – male & female*** *- (Wilson et al 1989; Matasha et al 1998; Tengia-Kessy et al 1998; Nicholas et al 2004; Operario et al 2007; Pluddemann et al 2008; Kazaura et al 2009; Chege et al 2012; Gever et al 2013; Vogt et al 2013; and Folayan et al 2014); Mbulawa et al 2014; Ybara et al 2018;* ***Range value - the reported range of prevalence*** *- (Kerwin et al 2014);* ***Reporting periods – used more than one reporting periods*** *- (Gever et al 2013; Cherie et al 2012 and Folayan et al 2014);* ***Sexual partners – casual & steady partners*** *- (Anderson et al 2009);* ***Study sites – multiple study sites*** *- (Akande 1994; Nell et al 2011); Okafor et al 2005 was excluded in this graph because it presented combined prevalence of oral and anal sex as a single estimate point. FSWs: Female sex workers; KAP: Key affected population. Status – Type of oral sexual practice*

Figure 2.3: Prevalence of heterosexual anal sex by study population



Multiple data points for author and year in the same study by: ***Data collection methods – Methods of interview used*** *- (Allen et al 2007; van der Est et al 2009; Mensch et al 2011);* ***Educational level – primary & secondary*** *- (Matasha et al 1998);* ***Gender – male & female*** *- (Operario et al 2007; Folayan et al 2014)* ***Study site*** *(Akande 1994; Abdool Karim et al 2010; Veldhuijezn et al 2011; AbdulKarim et al 2011; Nell et al 2011; Palanee-Philips et al 2015);* ***Sexual partners*** *-* ***casual & steady partners*** *- (Anderson et al 2009; Jemmot et al 2014);* ***Reporting period*** *-* ***used more than one reporting periods*** *- (Cherie et al 2012; Gever et al 2013; Folayan et al 2014 Okafor et al 2005 was excluded in this graph because it presented combined prevalence of oral and anal sex as a single estimate point. FSWs: Female sex workers; KAP: Key affected population. Status – Type of anal sexual practice]*

Table 2.2: Reported condom use during penetrative heterosexual sex (oral, anal and vaginal)

Author, Year (population category)	Report on condom use during heterosexual sexual act		
	Anal sex (n= 19 studies)	**Oral sex (n= 5 studies)**	**All penetrative sexual activities including oral or anal sex (n= 29 studies)**
Katsivo, 1991(KAP)	NA	NA	None of the participants used condom for any sexual acts
Akande, 1994 (GP)	22.5% Nigerian and 27.5% Zimbabwean often used condom during anal sex	13.2% Nigerian and 16.5% Zimbabwean often used condom during oral sex	NA
Cossa et al 1994 (GP)	NA	NA	Only 0.3% of women reported that their partner ever used condom
Feldman et al 1997 (GP)	14.3% of boys and girls reported condom use during anal sex	NA	NA
Abdool karim et al 1998	Women that were <25years old used condom in 63.4% while those that were ≥ 25years old used condom during 57.1% of anal sexual acts	NA	NA
Matasha et al 1998 (GP)	NA	NA	33% used condom for sexual activity
van Damme et al 2002 (KAP)	NA	NA	67% vs 66% of participants in intervention group and control group respectively used condom for ≥ 50 sexual acts with clients
			12% vs 6% of participants in intervention group and control group respectively used condom for ≥ 50 sexual acts with sexual partners
Ramjee et al 2002 (KAP)	23% of men reported using condom during anal sex	NA	NA
Kalichman et al 2004 (GP)	89% of women reported not using condom during anal sex		NA

Dunkle et al 2005 (KAP)	NA	NA	49.8% used male condom for 50-75% of their sexual acts while 34.6% reported using condom for > 75% of their sexual acts
Schwandt et al 2006 (KAP)	45% of FSW reported consistent condom use during anal sex with their clients 26.7% of FSW reported never using condom for anal sex with their clients	NA	NA
Jaspan et al 2007 (GP)	NA	NA	33% vs 26% reported ever using condom during sexual act when interviewed by paper or PDA respectively
Operario et al 2007 (GP)	NA	NA	27.6% of girls with both parents alive compared to 25.4% of girls with one or both parents deceased always used condom in the past 12 months 41.2% of boys with both parents alive compared to 36.9% of boys with one or both parents deceased always used condom in the past 12 months
Watson-Jones et al 2007 (KAP)	NA	NA	30% reported condom use during the last sex
Bing et al 2008 (KAP)	NA	NA	Condom use was 45.2% with girlfriends, 40.8% with occasional partners and 60.6% with commercial partners during anal or vaginal sex
Skoler-Karpoff et al 2008 (GP)	NA	NA	34% used condom during the sexual act
Kalichman et al 2009 (KAP)	Men and women used condom during 67% and 50% of anal sex acts respectively	NA	NA
Andersson et al 2009 (GP)	The mean condom use during anal sex was 49.5% for steady partners and 73.1% for casual/anonymous partners	NA	NA
Bamidele et al 2009 (GP)	NA	NA	40% used condom during last sexual activity
Abdool Karim et al 2010 (GP)	NA	NA	22.8% living in rural centres and 42.8% living in urban communities always used condom

Ambaw et al 2010 (GP)	NA	NA	46.6% of the sexually experienced participants reported ever using condom during their sexual acts
Kalichman et al 2011 (KAP)	8% of men and 7% of women reported anal sex without condom	NA	NA
Mensch et al 2011 (GP)	NA	NA	25.2% and 24.5% of participants interviewed by ACASI and FTFI respectively reported using condom always during sexual activity
Nel et al 2011 (GP)	NA	NA	44.5% of participants in Madibeng and 43.5% participants in Mbekweni used condom during last sexual act
Veldhuijenzn et al 2011 (KAP)	24% and 21% of women never used condom with regular and casual partners for anal sex respectively	NA	NA
Cherie et al 2012 (GP)	26.1% of boys and girls reported consistent condom use during anal sex	12.2% of boys and girls reported consistent condom use during oral sex	NA
Guedou et al 2012 (KAP)	NA	NA	77.7% of participant reported using condom during their last sexual act
van-Loggerenberg et al 2012 (KAP)	50% consistently used condom during anal sex	54.8% consistently used condom during oral sex	NA
Clain et al 2012 (KAP)	NA	NA	Reported consistent condom use between Shebeen and non- Shebeen patrons' that are men were 19% and 23% with primary partners, and 38% and 29% respectively for casual partners. Reported consistent condom use between Shebeen and non- Shebeen patrons' that are women were 23% and 29% with primary partners, and 29% and 9% respectively for casual partners.
Peltzer 2012 (KAP)	54.3% of men and women reported never using condom for anal sex	65% of men and women reported never using condom for oral sex	NA
Gaffoor et al 2013 (GP)	NA	NA	47.5% used condom during last sexual activity
Gevers et al 2013 (GP)	NA	NA	73.9% and 50% condom use at the last sexual activity among girls and boys respectively
Lambdin et al 2013 (KAP)	NA	NA	

			55% of men vs 69% of women reported condom use at last sexual act.
Asekun-Olarinmoye et al 2014 (GP)	NA	NA	54% of participants always use condom during sexual act.
Folayan et al 2014 (GP)	6.7% of boys and girls reported condom use during anal sex	1.7% of boys and girls reported condom use during oral sex	NA
Githuka et al 2014 (KAP)	13.2% women reported condom use at the last anal sex		
Thurton et al 2014 (GP)	NA	NA	5% of participants reported using condom in the past 6 months for sexual acts.
Anyanwu et al 2015 (GP)	20.6% always and 9.8% sometimes use condom during anal sex.	NA	NA
Noguchi et al 2015 (GP)	NA	NA	74.6% reported condom use during the last sexual act.
Animasahun et al 2016 (GP)	NA	NA	47.4% used condom during sexual acts.
Dubbink et al 2016 (GP)	NA	NA	36.2% used condom during the last sexual act.
McLellan-Lemal et al 2016 (GP)	2.9% of women reported condom use during anal sex in the past 12 months	NA	NA
Teasdale et al 2016 (GP)	NA	NA	70.5% of participants used condom during last sexual act.
Giorgio et al 2017 (KAP)	NA	NA	58.7% reported inconsistent condom use in the past 3 months.
Hladik et al 2017 (KAP)	NA	NA	32% reported condom use in last sexual act.
Longo et al 2017 (KAP)	NA	NA	36% reported condom use in the last 3 months.
Shayo et al 2017 (GP)	36.4% of participants always use condom during female anal sex, and 25% used condom during the last female anal sex.	NA	NA
Ybarra et al 2018 (GP)	36.7% of those that ever-had anal sex reported using condom half of time or less while 63.3% used condom more than half of the time	NA	NA

GP – General population; KAP – Key affected population; NA – Not available

Table 2.3: Factors reported to be associated with engaging in heterosexual oral and anal sex among adolescents and adults in sub-Saharan Africa

Author; Year; Country	Study population (no of individuals)	Test of association	Reported associated risk factor for Oral sex	Summary of results
Gathece et al 2000; Kenya	FSW (322)	Unadjusted, Chi Square	Age	Older respondents were more likely to engage in oral sex (X^2 =18.847, p=0.002)
Kazaura et al 2009; Tanzania	Adolescents in schools/community (885)	Unadjusted, Chi Square	gender	Male vs female (9.4% vs 5.8% p=0.07)
Chege et al 2012; Kenya	Adult men and women in community (846)	Unadjusted, Chi Square	gender	Male vs female (29% vs 21%, p=0.03)
Gever et al 2013; South Africa	Adolescents in schools/community (474)	Unadjusted, Chi Square and Fisher's Exact Test	type of sexual relationship by gender	**For Girls** In the past 3months: currently dating vs not currently dating (6.5% vs 0%; p<0.01) Ever practiced: currently dating vs not currently dating (8.1% vs 0.6%; p<0.01) **For Boys** In the past 3months: currently dating vs not currently dating (7.8% vs 2.0%; p<0.06 Ever practiced: currently dating vs not currently dating (20.2% vs 8.1%; p=0.01)
Folayan et al 2014; Nigeria	Adolescents in schools/community (357)	Unadjusted, Chi Square	Gender	female vs male (23.5% vs 15.1%, p=0.01)
Ambaw et al 2010; Ethiopia	University students (1945)	Adjusted, Logistic regression	Gender; level of education; faculty; place of residence; marital status	Male (AOR=1.6, 95%CI1.02-2.57); protestant (AOR=0.59, 95%CI 0.39-0.9); year one student (AOR=2.14, 95%CI1.23-3.66); business and economics faculty (AOR=5.47, 95%CI3.09-9.67), technology faculty (AOR=6.23, 95%CI3.32-11.67), humanities faculty (AOR=3.15, 95%CI1.92-5.18), social sciences faculty (AOR=2.96, 95%CI1.61-5.42) and education faculty (AOR=3.91, 95%CI2.01-7.61); out of campus (AOR=1.85, 95%CI1.09-3.14); have boy/girlfriend (AOR=1.81, 95%CI1.17-2.8)

Cherie et al 2012; Ethiopia	Adolescents in schools/community (3543)	Adjusted, Logistic regression	age; gender; attitude to oral sex; aspiration for college education; self-esteem; maternal education; partner education; perception of peer oral sexual activity and living arrangement	Younger age (AOR=3.2, 95%CI 1.9-5.3); female (AOR=1.3, 95%CI 1.1-2.2); positive attitude to oral sex (AOR=2.3, 95%CI 1.7-4.5); low aspiration to attend college education (AOR=3.1, 95%CI=2.8-5.9); low self-esteem (AOR=2.1, 95%CI 1.7-3.9); illiterate mother (AOR=11.5, 95%CI 6.4-18.5); illiterate father (AOR=1.4, 95%CI 0.9-3.2); friends that engage in oral sex (AOR=5.7, 95%CI 3.6-11.2); living with both parents (AOR=0.4, 95%CI 0.2-0.9)
Kerwin et al 2014; Malawi [100]	Adult men in community (2753)	Adjusted, Logistic regression	no of lifetime sex partners; ever used condom for oral sex; history of spending in the past 3months	higher total lifetime sex partner (AOR=1.04, 95%CI 1.02-1.06); ever used condom (AOR=3.16, 95%CI 1.47-6.8); history of spending in the last 3months (AOR=1.94, 95%CI 1.55-2.42)
Author; Year; Country	**Study population (no of individuals)**	**Test of association**	**Reported associated risk factor for Anal sex**	**Summary of results**
Chege et al 2012; Kenya	Adult men and women in community (846)	Unadjusted, Chi Square	Gender	female vs male (25% vs 16%, p=0.03)
Gever et al 2013; South Africa	Adolescents in schools/community (474)	Unadjusted, Chi Square and Fisher's Exact Test	type of sexual relationship by gender	**For Girls** In the past 3months: currently dating vs not currently dating (2.4% vs 0%, p=0.09) Ever practiced: currently dating vs not currently dating (3.3% vs 0%, p=0.04) **For Boys** In the past 3months: currently dating vs not currently dating (13.3% vs 2.0%, p<0.01) Ever practiced: currently dating vs not currently dating (15.6% vs 6.0%, p=0.01)
Priddy 2011; Kenya	FSW (200)	Unadjusted, Chi Square	type of sexual relationship	regular vs casual vs primary (35% vs 29% vs 9%, p<0.01)
Kalichman et al 2009; South Africa	Adult men and women in community /clinic (M = 2593; F = 1818)	Adjusted, Logistic regression	age; sexual relationship; history of condom use; history of STI; transactional sex; alcohol and cannabis abuse use in past 3 months; HIV test and status; number of sexual partners	Older age (AOR=0.97, 95%CI 0.96-0.98); married/living with partner (AOR=0.62, 0.5-0.77); never used condom (AOR=1.79, 1.49-2.17); history of STI (AOR=1.64, 1.46-1.85); received gift for sex (AOR=1.77, 1.57-1.99); given gift for sex (AOR=1.7, 1.51-1.9); alcohol use in past 3 months (AOR=2.16, 1.77-2.63); cannabis use in past 3months (AOR=1.97, 1.62-2.4); had HIV test (AOR=1.44, 1.19-1.73); test HIV positive (AOR=2.62, 1.89-3.63); increased number of sexual partners (AOR=1.26, 1.2-1.32); unprotected vaginal intercourse (AOR=0.97, 0.94-0.98); previous vaginal intercourse with condom

				(AOR=1.04, 1.03-1.05); increasing percentage condom use during vaginal intercourse (AOR=5.61, 4.27-7.37)
Ambaw et al 2010; Ethiopia	University students (1921)	Adjusted, Logistic regression	Faculty; marital status	Business and economics faculty (AOR=6.3, 95%CI2.64-15.05), technology faculty (AOR=7.5, 95%CI2.96-18.99), humanities faculty (AOR=4.59, 95%CI2.19-10.05), social sciences law faculty(AOR=3.02, 95%CI1.15-7.94) and education faculty (AOR=5.85, 95%CI2.26-15.1); ever married (AOR=4.06, 95%CI1.53-10.79)
Veldhuijzen et al 2011; Rwanda and Kenya	FSW Kigal = 800; Momb = 820	Adjusted, Logistic regression	inconsistent condom use; number of sexual partner; alcohol use before sex; year of sex work and history of genital symptoms	**For the Kigali cohorts** - inconsistent condom use with casual partner (AOR=5.9, 95%CI 1.4-24.7); had more than 5 sexual partners in last week (AOR=4.34, 95%CI 1.52-12.36); regular use of alcohol before sex (AOR=2.83, 95%CI 1.37-5.84). **For Mombasa cohorts** - more than 5 years of sex work (AOR=2.44, 95%CI 1.22-4.89); inconsistent condom use with casual partner or client (AOR=2.1, 95%CI 1.10-4.20); condom not used in the last sex (AOR=3.40, 95%CI 1.70-6.80); had more than 5 sexual partners in last week (AOR=2.20, 95%CI 1.10-4.30); had genital symptoms (AOR=3.60, 95%CI 1.70-7.90).
Kalichman et al 2011; South Africa [	Men and women attending bar/night clubs (4965)	Adjusted, Logistic regression	age; education; type of sexual relationship; meeting sexual partner in Shebeen in past months	Age (AOR=0.97, 95%CI 0.96-0.98); primary sexual partner (AOR=1.56, 1.19-2.05); casual sexual partner (AOR=2.33, 1.92-2.83); meeting sexual partner in Shebeen (drinking spot) in the past month (AOR=1.81, 95%CI 1.47-2.22)
Cherie et al 2012; Ethiopia	Adolescents in schools/community (3543)	Adjusted, Logistic regression	age; gender; attitude to oral sex; aspiration for college education; self-esteem; maternal education; partner education; perception of peer oral/anal sexual activity and living arrangement	Younger age (AOR=1.7, 95%CI 1.3-3.1), female (AOR=2.9, 1.6-4.7), having positive attitude towards anal sex (AOR=6.2, 95%CI 3.8-12.4), having low aspiration for college education (AOR=4.2, 95%CI 2.8-8.1), having low self-esteem (AOR=1.6, 95%CI 1.2-3.1); illiterate mother (AOR=11.6, 95%CI 7.8-19.6); illiterate father (AOR=7.8, 95%CI 5.3-14.9); friends that engage in oral/anal sex (AOR=9.7, 95%CI 5.4-17.7); living with both parents (AOR=0.4, 95%CI 0.2-0.9)

AOR – Adjusted odds ratio; CI – Confidence interval; M – Male; F – Female

Table 2.4: Selected data from qualitative studies reporting on heterosexual oral and anal sex in sub-Saharan Africa by year of publication

Author; Year	Country	Study design	Sampling; Data collection methods	Study population	Gender (M/F); Age (yrs)	Summary of Key findings on oral sex	Assessment of risk of bias
Gathece et al 2000	Kenya	Mixed methods	Purposive sampling; NS Focus group discussions and In-depth interviews	FSW (KAP)	F: 30.5	Participants said that there was no need to use condom during oral sex because they felt that oral sex is "safer" than vaginal sex.	high-risk of bias
Author; Year	**Country**	**Study design**	**Sampling; Data collection methods**	**Study population**	**Gender (M/F); Age (yrs)**	**Summary of Key findings on Anal sex**	**Assessment of risk of bias**
Stadler et al 2007	South Africa	Qualitative	Purposive sampling; Focus group discussion	Adult women in community (GP)	F; NS	Some of the local terminologies of anal sex that were mentioned by participants included: "pata pata", "matanyula" and "dog style". Participants had open discussions on anal sex. They mentioned pornographic films and television as sources of information of anal sex. The reported reasons for engaging in anal sex that were discussed included: a form of partner punishment and coercion, sexual experimentation and partner desire or pleasure. Some of the misconceptions that emerged during discussion were: anal sex is safer than penile-vaginal sex, anal sex was regarded as a form of contraception and it could prevent STIs/HIVs.	low risk of bias
Mavhu et al 2008	Zimbabwe	Qualitative	Purposive sampling; 65 In-depth interviews	Adolescent and Adult in the community (GP)	M and F:18-40	Participants were uncomfortable with "anal sex" as a question. They preferred anal sex to be referred to as "sex at a place where wastes (faeces) comes out" or "sex at backside". Some referred to anal sex as "doggy style". They described anal sex as "homosexual do".	low risk of bias

Ndinda et al 2008	South Africa	Qualitative	Purposive sampling; 11 Focus group discussions	Adult men and women in community (GP)	MandF; NS	Participants were reluctant to talk about anal sex. They largely used proxy names in Zulu to describe anal sex. There was poor understanding about the meaning of anal sex. They expressed shock and disbelief when the facilitator told them the meaning of anal sex as “having sex in the faecal passage". Some participants felt that anal sex is practiced only by MSM. They expressed shock and disbelief when the facilitator told them the meaning of anal sex as “having sex in the feacal passage". Some participant felt that anal sex is practiced only by MSM.	low risk of bias
Ambaw et al 2010	Ethiopia	Mixed methods	Purposive sampling; 6 Focus group discussions	University students (GP)	M and F: 17-45	Participants interpreted sexual intercourse to mean heterosexual and vaginal sex. They believed only "whites" (ferenges) accept anal sex as a form of sexual intercourse	low risk of bias
Veldhuijezn et al 2011	Kenya and Rwanda	Mixed methods	Purposive sampling; 7 Focus group discussions and 4 In-depth interviews	FSW in Kigali only (KAP)	F; 22-30	Some FSWs had strong negative perceptions about clients requesting anal sex. They believed that anal sex was mostly requested by non-Rwandans. The most common reported reason for engaging in anal sex was a financial incentive. Some participants said that anal sex practices are associated with alcohol use. Some FSWs reported that their clients do not use condoms for anal sex.	low risk of bias
Duby et al 2014	Kenya, Tanzania and Uganda	Qualitative	Purposive sampling; 40 Focus group discussions and 54 In-depth interviews	Adult men and women in community/clinics (KAP)	M and F; NS	Participants demonstrated a good knowledge of anal sex, but they were reluctant to discuss their personal experiences. They also regarded anal sex as a taboo. Reported reasons for engaging in anal sex that were discussed included: preserving virginity, contraception, financial incentives, as an alternative	low risk of bias

						when vaginal sex was not feasible (e.g. pregnancy and menstruation), to satisfy their male partner's pleasure, adventure and novelty. Participants had the misconception that anal sex is safer than vaginal sex, is associated with lesser risk of HIV/STIs and hence there is no reason to use condoms.	
Beckham et al 2015	Tanzania	Qualitative	Purposive sampling; 3 Focus group discussions and 30 In-depth interviews	FSW (KAP)	F; 20-40	Participants had open discussion about anal sex including their personal experiences with clients. The main reported reason for engaging anal sex was receiving higher financial incentives than for penile-vaginal sex. Clients paid more for requesting unprotected anal sex.	low risk of bias
Mtenga et al 2015	Tanzania	Qualitative	Purposive sampling; 24 Focus group discussions and 81 In-depth interviews	Adult men and women in community (KAP)	M and F; NS	Truck drivers and their female partners said heterosexual anal sex is increasingly being practiced in Tanzania. Reasons for engaging in anal sex by men included: seeking better sexual pleasure than vaginal sex, to avoid pregnancy, to prove to their female partners that they are sexually strong and for sexual adventure. Women mentioned receiving greater financial gains with anal sex compared to vaginal sex, that anal sex helped to retain their sexual partners, that it could prevent pregnancy, was an alternative during menstruation and fattening their buttocks to improve their beauty to suitors as reasons for practicing anal sex. Both men and women said a barrier method is not needed during anal sex because the sexual act is safer than vaginal sex, sexual pleasure will be reduced and there is a fear of losing the condom inside the anus.	low risk of bias

Wamoyi et al 2015	Tanzania	Qualitative	Purposive sampling; 4 Focus group discussions and 16 In-depth interviews	Adult men and women in community/clinics (KAP)	MandF; 20-30	There was culture of silence about anal sex and participants used proxy names for the practice. Participants believed that anal sex was mostly practiced by foreigners, young people, FSWs and Arabs. Reported reasons for engaging in anal sex that were described by participants included: adventure, 'trending', financial incentives and male partner desire. Women felt that anal sex was associated with delivery complications, and anal incontinence. Male participants reported that engaging in anal sex could cause blockage of the anus and urinary system, and cancer. Both male and female participants believed that anal sex is risky and there was a need to use condom during anal sexual act.	low risk of bias
Duby et al 2016	South Africa; Uganda; Zimbabwe	Qualitative	Purposive sampling; 88 In-depth interviews	Adult women in community (GP)	F: NS	Some participants expressed "shock", "disbelief", "disgust", "embarrassment" and "denial" about anal sex. some believed that anal sex should not be openly discussed. There were misconceptions that the back side vaginal sex and anal sex were the same sexual act by the participants until it was explained by the researcher with annotated diagram. A number of participants preferred to use alternative name for anal sex e.g. "hidden part", "down there" and "where faeces comes out". Women reported engaging in anal sex in order to satisfy their partners' sexual pleasure/ They considered anal sex to be safer than vaginal sex and as an alternative sexual act when vaginal sex was not feasible. Some engaged in anal sex for better financial gains.	low risk of bias

Mazeingia et al 2017	Ethiopia	Qualitative	Snow ball Sampling; 18 In-depth interviews	FSW (KAP)	F:18-39	Participants engaged in anal sex with their clients for financial gains, for personal sexual pleasure, due to coercion by clients and to satisfy their lovers (husband or boyfriends).	low risk of bias
Shayo et al 2017	Tanzania	Mixed methods	Purposive sampling; 20 Focus group discussions	Adolescent and Adult in the community (GP)	F:>=15	Heterosexual anal sex was perceived to be more culturally acceptable especially among the younger population and it is regarded as part of love making. Some women said men force them to practice anal sex against their wish while other women engage in anal sex to protect their sexual relationships. Some women suffered discrimination among their peers for refusing anal sex. A number of participants believed that anal sex is safe without using any barrier methods. Lubricants such as "jelly" were believed to enhance anal sex pleasure and to minimise risk of injury.	low risk of bias

GP – General Population; KAP: Key Affected Population; M – Male; F – Female; FSW – Female sex worker; NS – Not stated; Yrs – Years

Table 2.5: Assessment of critical information on the design of quantitative studies

Author; Year	Study Population	Response Rate	Eligibility Criteria	Sampling technique	Definition of Exposure/outcome in methods (anal sex)	Definition of Exposure/outcome in methods (oral sex)	Prevalence of outcome by sexual behaviour role (anal sex)	Prevalence of outcome by sexual behaviour role (oral sex)	Confounders/Risk factors measured	Ethical approvals obtained
Soyinka 1979	Yes	Yes	NR	Yes	No	No	No	No	No	No
Van de Perre et al 1985	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No
Wilson et al 1989	Yes	No	Yes	No	No	No	Yes	Yes	No	No
Katsivo et al	Yes	No	Yes	No	No	NA	Yes	NA	NA	No
Akande 1994	Yes	No	Yes	Yes	No	No	No	No	No	No
Cossa et al 1994	Yes	Yes	Yes	No	No	No	Yes	No	No	No
Feldman et al 1997	Yes	No	No	Yes	No	No	No	Yes	NA	No
Abdool Karim et al 1998	Yes	No	Yes	NR	No	NA	Yes	NA	NA	No
Matasha et al 1998	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Tengia-Kessy et al 1998	Yes	Yes	Yes	Yes	NA	No	NA	No	No	No
Fawole et al 1999	Yes	No	No	No	NA	No	NA	No	No	No
Sallah et al 1999	Yes	Yes	Yes	Yes	No	NA	Yes	No	NA	Yes
Fonk et al 2000	Yes	Yes	Yes	No	No	NA	Yes	NA	No	Yes
Gathece et al 2000	Yes	No	Yes	No	NA	No	NA	No	Yes	No
Okesola et al 2000	Yes	No	No	No	NA	No	NA	No	No	No
van Dammee et al 2002	Yes	Yes	Yes	Yes	No	NA	Yes	No	No	Yes
Ramjee et al 2002	Yes	Yes	Yes	No	No	NA	Yes	NA	No	Yes
Kalichman et al 2004	Yes	No	No	No	No	NA	Yes	NA	No	No
Nicholas 2004	Yes	No	Yes	No	No	No	Yes	No	No	No
NNoruka et al 2005	Yes	No	No	No	No	No	No	No	No	No
Okafor et al 2005[¥]	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Mpofu et al 2006	Yes	No	Yes	Yes	Yes	NA	No	NA	No	No

Schwandt et al 2006	Yes	Yes	Yes	Yes	No	NA	Yes	No	Yes	Yes
Dunkle et al 2005	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes
Jaspan et al 2007	Yes	Yes	Yes	No	No	NA	Yes	NA	No	Yes
Allen et al 2007	Yes	No	Yes	Yes	No	NA	Yes	NA	No	Yes
Operario et al 2007	Yes	Yes	Yes	Yes	No	No	Yes	No	NA	Yes
Watson-Jones et al 2007	Yes	Yes	Yes	No	No	NA	Yes	NA	No	Yes
Adoga et al 2009	Yes	Yes	Yes	No	No	NA	Yes	NA	NA	Yes
Cornman et al 2008	Yes	Yes	No	No	No	No	Yes	No	No	Yes
Bing et al 2008	Yes	Yes	Yes	Yes	No	NA	Yes	NA	No	Yes
Grijsen et al 2008	Yes	Yes	Yes	No	Yes	NA	Yes	NA	Yes	Yes
Morhason-Bello et al 2008	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes
Pluddemann et al 2008	Yes	No	No	Yes	No	No	Yes	No	Yes	Yes
Skoler-Karpoff et al 2008	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes
Andersson et al 2009	Yes	No	Yes	No	No	No	No	No	Yes	Yes
Bamidele et al 2009	Yes	Yes	Yes	Yes		No	No	No	No	No
Kalichman et al 2009	Yes	Yes	Yes	No	No	NA	Yes	NA	Yes	Yes
Kazaura et al 2009	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes
van der Elst et al 2009	Yes	Yes	Yes	Yes	No	NA	Yes	NA	No	Yes
Abdool karim et al 2010	Yes	No	Yes	No	No	NA	Yes	NA	No	Yes
Abdool Karim et al 2011	Yes	Yes	Yes	No	No	NA	Yes	NA	No	Yes
Ambaw et al 2010	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Opoku 2010	Yes	No	Yes	No	No	No	Yes	No	No	No
Kalichman et al 2011	Yes	Yes	Yes	No	Yes	NA	Yes	NA	Yes	Yes
Maswanya et al 2011	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No
Mensch et al 2011	Yes	Yes	Yes	No	Yes	NA	Yes	NA	No	Yes
Priddy et al 2011	Yes	No	Yes	No	No	NA	Yes	NA	No	Yes
Nel et al 2011	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes

Venkatesh et al 2011	Yes	Yes	Yes	No	No	NA	Yes	NA	No	Yes
Veldhuijezn et al 2011	Yes	No	Yes	No	Yes	NA	Yes	NA	Yes	Yes
Clain et al 2012	Yes	Yes	Yes	Yes	No	NA	Yes	NA	Yes	Yes
Chege et al 2012	Yes	No	Yes	No	No	No	Yes	No	NA	Yes
Cherie et al 2012	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Guedou et al 2012	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Loggerenberg et al 2012	Yes	No	Yes	No	No	No	Yes	No	No	Yes
Peltzer 2012	Yes	Yes	Yes	No	No	No	No	No	No	Yes
Gaffoor et al 2013	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes
Gray et al 2013	Yes	No	Yes	No	No	NA	Yes	NA	No	Yes
Guffey et al 2014	Yes	Yes	Yes	Yes	No	NA	Yes	NA	No	Yes
Essomna et al 2013	Yes	No	Yes	No	No	NA	Yes	NA	No	Yes
Gevers et al 2013	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Kakoko 2013	Yes	No	Yes	Yes	No	No	No	No	NA	Yes
Lambdin et al 2013	Yes	Yes	Yes	No	No	NA	Yes	NA	NA	Yes
Scott-Sheldon et al 2013	Yes	Yes	Yes	No	Yes	NA	Yes	NA	No	Yes
Vogt et al 2013	Yes	No	Yes	No	NA	Yes	NA	NA	NA	Yes
Asekun-Olarinmoye et al 2014	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes
Davidson et al 2014	Yes	No	Yes	No	NA	No	NA	No	NA	Yes
Folayan et al 2014	Yes	Yes	Yes	Yes	No	No	NA	No	Yes	Yes
Githuka et al 2014	Yes	Yes	Yes	Yes	Yes	NA	Yes	NA	NA	Yes
Jemmott et al 2014	Yes	Yes	Yes	Yes	Yes	NA	Yes	NA	No	Yes
Kerwin et al 2014	Yes	No	Yes	Yes	NA	No	No	NA	Yes	Yes
Mbulawa et al 2014	Yes	No	Yes	No	NA	NA	NA	No	No	Yes
Meque et al 2014	Yes	No	Yes	Yes	NA	Yes	NA	No	Yes	Yes
Anyanwu et al 2015	Yes	Yes	Yes	No	No	NA	Yes	NA	NA	Yes
Noguchi et al 2015	Yes	Yes	Yes	No	No	NA	Yes	NA	Yes	Yes

Palanee-Phillips et al 2015	Yes	Yes	Yes	No	No	No	Yes	NA	No	Yes
Thurston et al 2014	Yes	Yes	Yes	No	No	No	Yes	NA	Yes	No
Animasahun et al 2016	Yes	Yes	Yes	Yes	NA	No	NA	No	NA	Yes
Arulogun et al 2016	Yes	Yes	Yes	Yes	NA	No	NA	No	NA	Yes
Dubbink et al 2016	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes
Lawan et al 2016	Yes	Yes	Yes	Yes	No	No	Yes	No	NA	Yes
Luma et al 2016	Yes	Yes	Yes	No	No	No	No	NA	NA	Yes
McLellan-Lemal et al 2016	Yes	Yes	Yes	No	No	No	Yes	NA	No	Yes
Teasdale et al 2016	Yes	Yes	Yes	Yes	No	NA	Yes	NA	NA	Yes
Dareng et al 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Giorgio et al 2017	Yes	Yes	Yes	No	No	No	Yes	NA	NA	Yes
Hladik et al 2017	Yes	Yes	Yes	No	No	NA	Yes	NA	NA	Yes
Longo et al 2017	Yes	Yes	Yes	No	No	NA	Yes	NA	NA	Yes
Shayo et al 2017	Yes	Yes	Yes	Yes	Yes	NA	Yes	NA	Yes	Yes
Chikandiwa et al 2018	Yes	Yes	Yes	Yes	No	No	Yes	Yes	NA	Yes
Davey et al 2018	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes
Maheu-Giroux et al 2018	Yes	Yes	Yes	No	Yes	NA	Yes	NA	NA	Yes
Ybarra et al 2018	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	NA	Yes

CD: Cannot determine; NA: Not Applicable; NR: Not reported. Study population(Yes – provides information on study population); Response rate (Yes=the response rate was indicated ihe manuscript); Eligibility criteria (Yes=The inclusion and or exclusion criteria was described in the manuscript); Sampling technique (Yes=There was a description of sampling method in the manuscript); Definition of exposure (Yes=There was a description of operational definition of outcome measure – oral or anal sex in the manuscript); Prevalence of outcome by sexual behaviour role (Yes=The prevalence (proportion) of outcome was presented for insertive or receptive sexual behaviour role in the manuscript); Confounders/Riskfactors measured (Yes=The confounders were stated and presented in the analysis); Ethical approval (Yes=A statement on ethical approval was described in the manuscript); No=Absence of any of the assessment indicators in the manuscript that was reviewed.

Table 2.6: Assessment of critical information on the design of qualitative studies

Author; Year	Aim	Method Appropriate	Study Design appropriate	Recruitment appropriate	Data collection method	Researcher & Participant Relationship	Ethical consideration	Data analysis sufficient	Findings clearly discussed	Significance of the study	Reviewers comments
Stadler et al 2007	Yes	Yes	Yes	CT	CT	Yes	No	CT	Yes	Yes	low risk of bias
Mavhu et al 2008	Yes	Yes	Yes	CT	CT	No	Yes	CT	CT	Yes	low risk of bias
Ndinda et al 2008	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	low risk of bias
Veldhuijezn et al 2011	Yes	Yes	Yes	CT	CT	No	Yes	CT	CT	Yes	low risk of bias
Duby et al 2014	Yes	Yes	Yes	Yes	Yes	CT	No	Yes	Yes	Yes	low risk of bias
Beckham et al 2015	CT	Yes	Yes	Yes	Yes	CT	Yes	Yes	Yes	Yes	low risk of bias
Matenga et al 2015	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	low risk of bias
Wamoyi et al 2015	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	low risk of bias
Duby et al 2016	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	low risk of bias
Mazeingia et al 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	low risk of bias
Mtenga et al 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	low risk of bias
Shayo et al 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	low risk of bias

CT: cannot be determined; Aim (Yes=The aim or objective of the study was described in the manuscript); Method (Yes=The correct method of analysis was used and described in the manuscript); Study design appropriate (Yes = Assessment whether the study design was correctly described in the manuscript); Recruitment appropriate (Yes=A detailed description of the process of recruitment of participants); Data collection (Yes= A description of the process of data collection in the manuscript); Researcher and participant relationship (Yes=There was information on the role and or relationship of researcher and participant in a section of the manuscript); Ethical consideration (Yes=a description of ethical approval and other related statements in the manuscript); Data analysis sufficient (Yes=A description of analysis methods including description of clear outcomes and methods of data synthesis); Findings clearly discussed (Yes=A clear summary of outcomes/themes on different aspects of oral and or anal sexual behaviours including information on how the themes were formed from the analysis); Signficance of the study (Yes=A summary of clear message of the manuscript as it relates to oral and or anal sexual behaviour); No=lack of information of any of the key indicators that were assessed. Reviewers comments = overall assessment

DISCUSSION

This is the first systematic review of reported prevalence of oral and anal sex among adolescents and adults reporting heterosexual sex in SSA. The review showed a large range of reported prevalences for both behaviours. Generally, the range of prevalences were similar among key affected and general populations. However, reported prevalences of oral and anal sex among FSWs and university students tended to be higher than in other population groups of adolescents and adults. In addition, reported prevalences of both oral and anal sex tended to be higher among males than females. Few studies reported the use of condoms or other barrier methods with oral and anal sex with a number of them reporting low or inconsistent condom use during oral and anal sex. Factors associated with these behaviours showed that those who engaged in oral and anal sex often also engaged in other high-risk activities such as having frequent and multiple sexual partners, illegal substance or alcohol use, and inconsistent condom use. Oral and anal sex are important modes of transmission for STIs, and these data are vital for understanding sexual behaviours in populations at high risk for STIs including HIV, oral and anal cancers.

Findings from three qualitative studies provided possible explanations for engaging in unprotected anal sex [300, 302, 303] including that it was regarded as less risky than vaginal sex and could prevent STIs, including HIV. Anal sex was also associated with an exchange of money or gifts among FSWs. Studies from the USA also showed that the belief that oral sex is without health risk, and subjects not regarding oral and anal sex as “having sex” are perceptions that might have accounted for low condom use [337, 338]. Qualitative research also illustrated a culture of silence in discussing anal sex, and many of those that discussed it expressed shock and disbelief that such sexual acts existed within heterosexual relationships. This, combined with the belief by some boys/men that performing heterosexual anal sex demonstrates a supremacy over girls/women, may further create a culture of secrecy, shame, and transgression. Indeed, women reported coercion for anal sex and a perception that men engaged in it to punish them. In such an environment, discussion about safety and condom use may be undermined, and strategies for STI control may be challenging. More research is needed to further understand motivations for and meaning of engaging in oral and anal sex in SSA, as well as opportunities and challenges for addressing violence, safety and STI/HIV risk.

The comparatively higher prevalences of oral and anal sex among some key affected populations compared to general populations in this review has also been widely reported in high-income countries. Some studies among key affected populations suggested that these behaviours were associated with increased use of alcohol and substance abuse during sexual activity, increased frequency of sexual acts and multiple sexual partners [339-343]. Men who engaged in anal sex with FSWs were more likely to have consumed alcohol and to be a frequent customer[339]. Apart from these reasons, it has also been reported that FSWs engaged more in oral and anal sex to satisfy their clients' requests and for financial gain [339, 344]. This was corroborated by two qualitative studies included in this review where FSWs reported economic gain as the main reason for engaging in anal sex [290, 303]. Adolescents in Ethiopia also reported receiving gifts or money for practicing oral and anal sex[252].

High prevalences of oral and anal sex were observed among university students, and this is similar to findings from studies in high-income countries. In the UK NATSAL survey, young people were more likely to report oral and anal sex than older adults, irrespective of gender [222]. The increased reporting of oral and anal sex among young people has been associated with changing perception of sexual activity among younger generations and the influence of social media, including pornography, amongst others [345-348]. An Australian study that was conducted among young people found that previous anal sex experience was associated with frequent use of pornography[348]. It will be important that adolescent health providers are aware that these behaviours are now being practiced by young people across the continent, and education programmes will need to be tailored to addressing the risks associated with these behaviours and how these can be prevented.

Although routine testing for oropharyngeal and anal infections is recommended in high-income countries for sexually active MSM[349, 350], some argue that exclusion of sexually active women with history of receptive oral and anal sex from routine testing will lead to missed opportunities for early detection of STIs and the prevention of onward transmission [349, 350]. The cost-effectiveness of routine testing for asymptomatic pharyngeal and anal infection is unclear[350]. A routine testing strategy is not yet a feasible option for people reporting heterosexual oral and anal sex in SSA. However, raising awareness on the risk of contracting STIs during condomless oral and anal sex through information, education and counselling programmes could be a practicable strategy in the region. It is also imperative

that policy makers in the region expand the concept of hetero-normative sexual acts to include oral and anal sex.

The higher prevalence of reported oral and anal sex by males in this review should be interpreted within a context of reporting bias. Studies in SSA and other regions have shown that during self-reported sexual behaviour interviews, males tend to report a higher number of sexual partners, non-marital partners and concurrent relationships than females, and females may under-report numbers of sexual partnerships [351-353]. Reporting differences by gender may also vary according to the specific sexual behaviour. Available evidence from population studies in the UK and USA showed that more men or boys reported receiving oral sex than women or girls in heterosexual relationship [222, 354]. In the same report, more girls were reported to give oral sex than boys. Some researchers argued that gender differences in the reporting of sexual activity might be influenced by the perception of sexual pleasure, health risks and beliefs[355, 356]. A qualitative study further showed that men preferred to receive oral sex from their partners than to give oral sex to their partners because they perceived receiving oral sex to be less risky and giving oral sex to be a dirty and dangerous practice[357].

The strengths of this review are the range of prevalences across geographic sub-regions, populations and ages within SSA. However, there are a number of limitations. There were very few population-based estimates of the oral and anal sex prevalence such as prevalences reported in the population-based studies in the UK and Australia [219, 222]. Instead, there was a wide range of prevalences of oral and anal sex observed in various population sub-groups which are unlikely to be generalizable. In addition, there were several methodological weaknesses in the studies reviewed including inconsistent operational definitions of oral and anal sex. Furthermore, studies also used different reporting periods, making it challenging to pool and compare results across population sub-groups and settings in SSA.

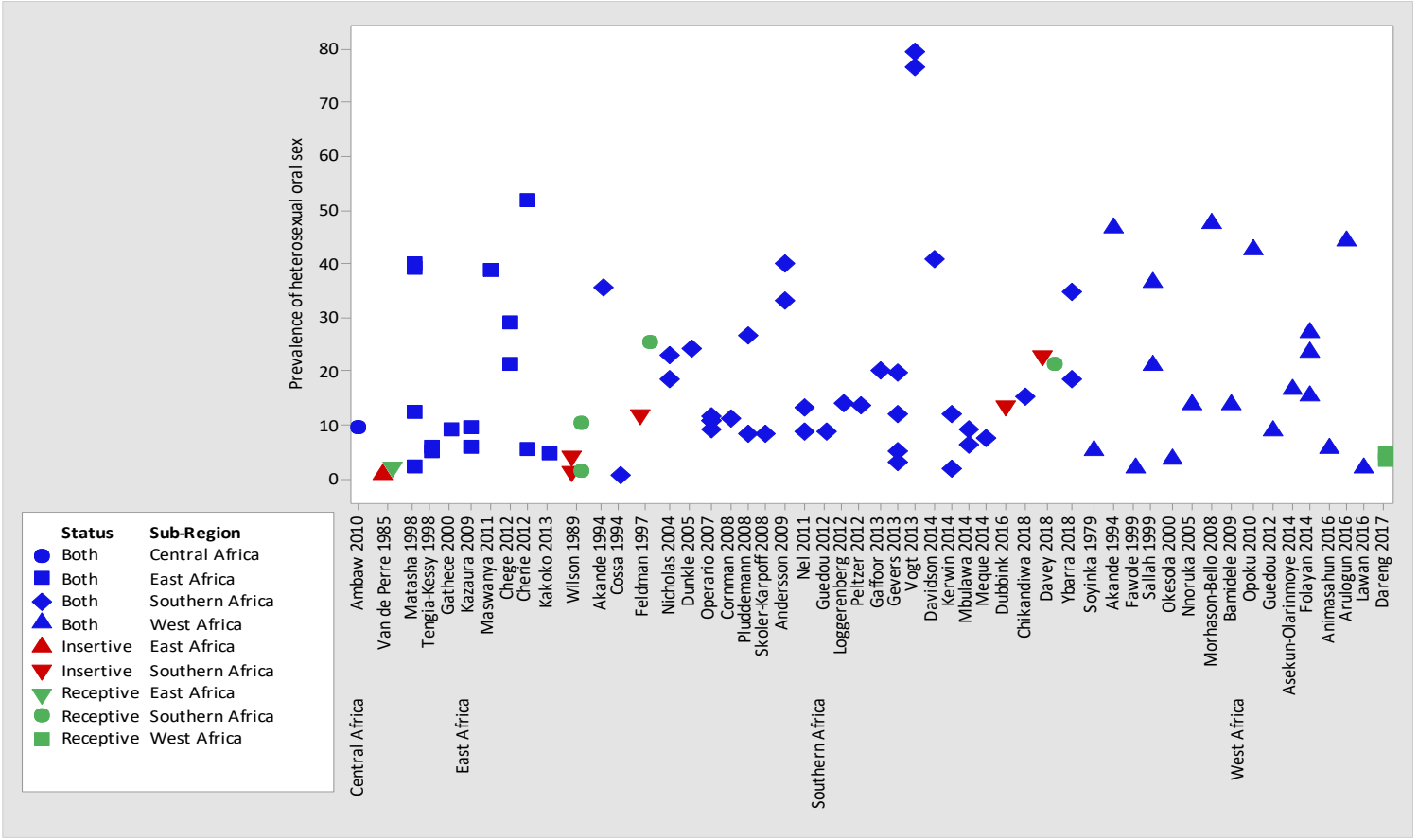
In addition to reporting gender bias discussed above, there is likely to be under-reporting of these sensitive behaviours due to social desirability bias, especially for heterosexual anal sex, since this practice is not well accepted in some communities [301, 302, 358]. Many studies were assessed as having a high-risk of bias and did not provide information on how their sample sizes were determined. Lastly, restricting our inclusion criteria to only published, peer

reviewed articles, limiting our search to seven databases, and exclusion of MSM that also engaged in heterosexual oral and anal sex could have resulted in our missing other studies that reported on oral and anal sex in the region.

CONCLUSION

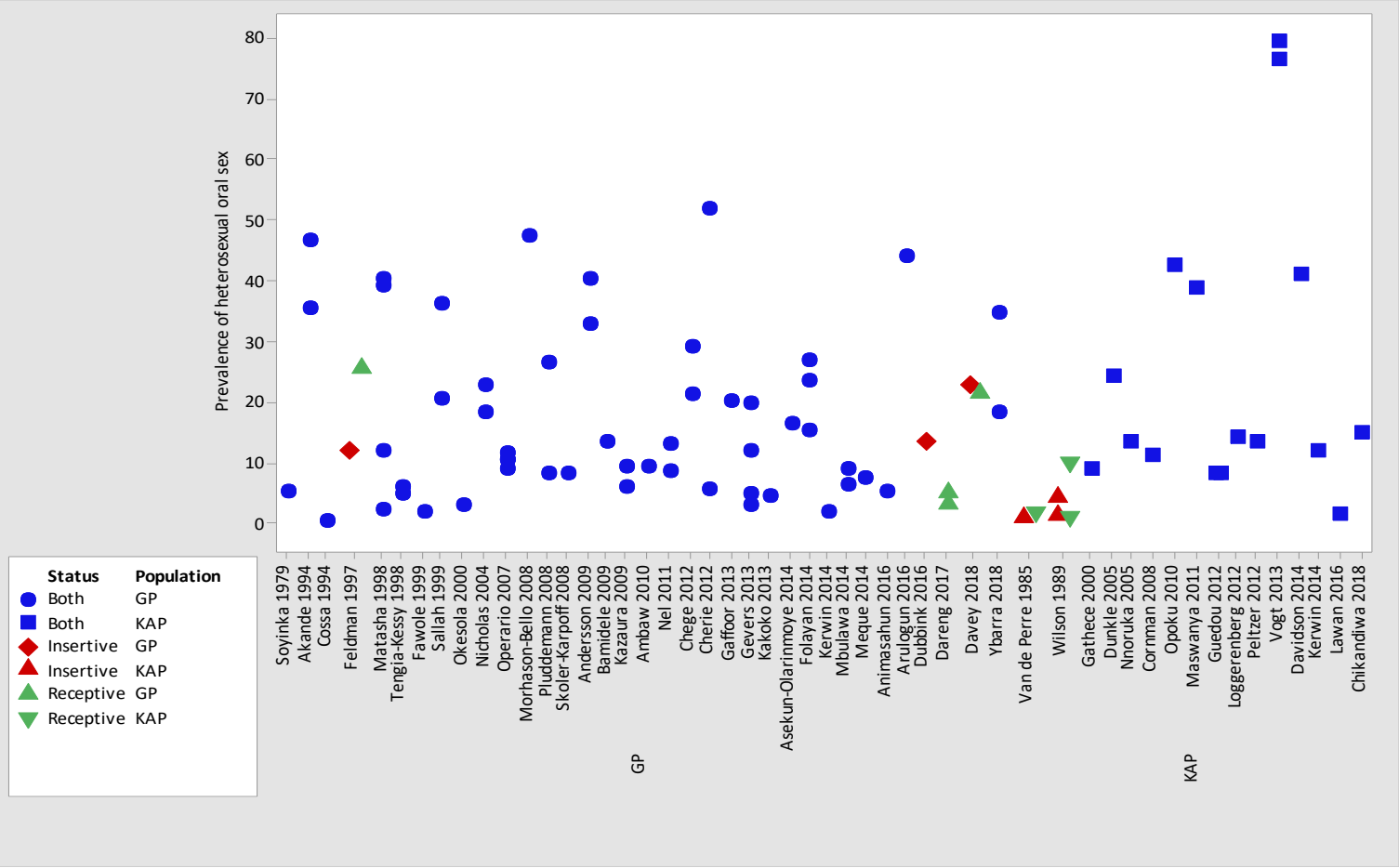
In summary, oral and anal sex are commonly practiced among adolescents and adults reporting heterosexual sex in SSA, often without condom use. Future sexual reproductive health research investigating risks for STIs should incorporate questions on oral and anal sex using clear definitions of these behaviours. Well powered and rigorous population-based study designs similar to studies in the United Kingdom and Australia [219, 222] are needed to understand population estimates of these behaviours, their associated morbidities, and changes in sexual behaviour trends over time. Researchers should also consider using qualitative research methods, complimentary tools such as pictures/drawings and other visual aids to elicit more accurate responses from participants[358]. Accurate data are needed to inform reproductive and sexual health policies, and information on oral and anal sex and their health risks should be included in information, education and counselling messages for both the key affected and general populations.

Supplementary Figure 1: Prevalence of oral sex by sub-region



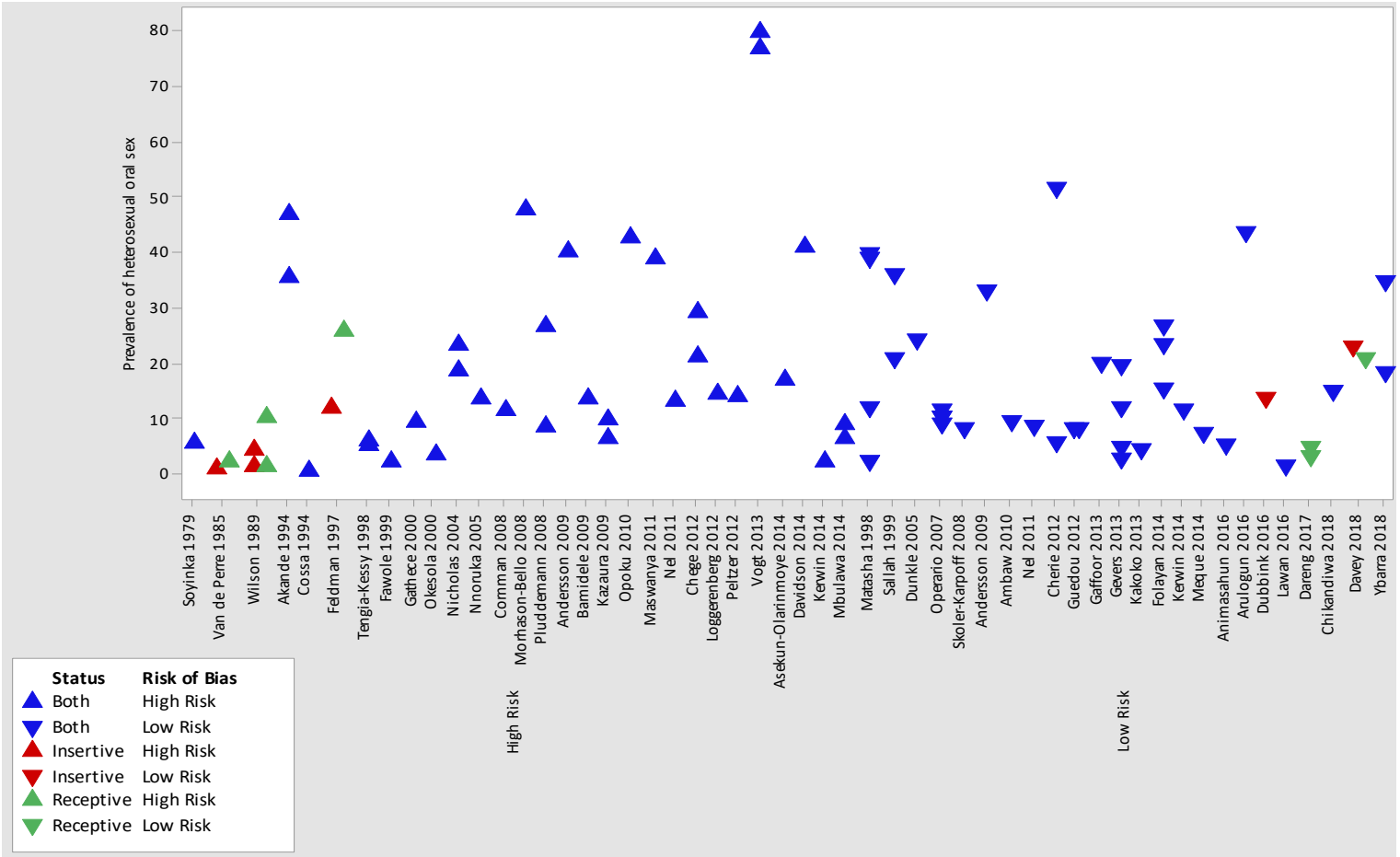
Multiple data points for the same author and year referred to disaggregated data by: ***Educational level*** *(Matasha et al 1998);* ***Gender*** *(Wilson et al 1989; Matasha et al 1998; Tengia-Kessy et al 1998; Nicholas et al 2004; Operario et al 2007; Pluddemann et al 2008; Kazaura et al 2009; Chege et al 2012; Gever et al 2013; Vogt et al 2013; and Folayan et al 2014); Mbulawa et al 2014; Ybara et al 2018;* ***Range value*** *(Kerwin et al 2014);* ***Reporting periods*** *(Gever et al 2013; Cherie et al 2012 and Folayan et al 2014);* ***Sexual partners*** *(Anderson et al 2009);* ***Study sites*** *(Akande 1994; Nell et al 2011); A study by Okafor et al 2005 that presented combined prevalence of oral and anal sex as a single estimate point was excluded in this graph. FSWs: Female sex workers; KAP: Key affected Population. Status – Type of oral sexual practice*

Supplementary Figure 2: Prevalence of oral sex by population category



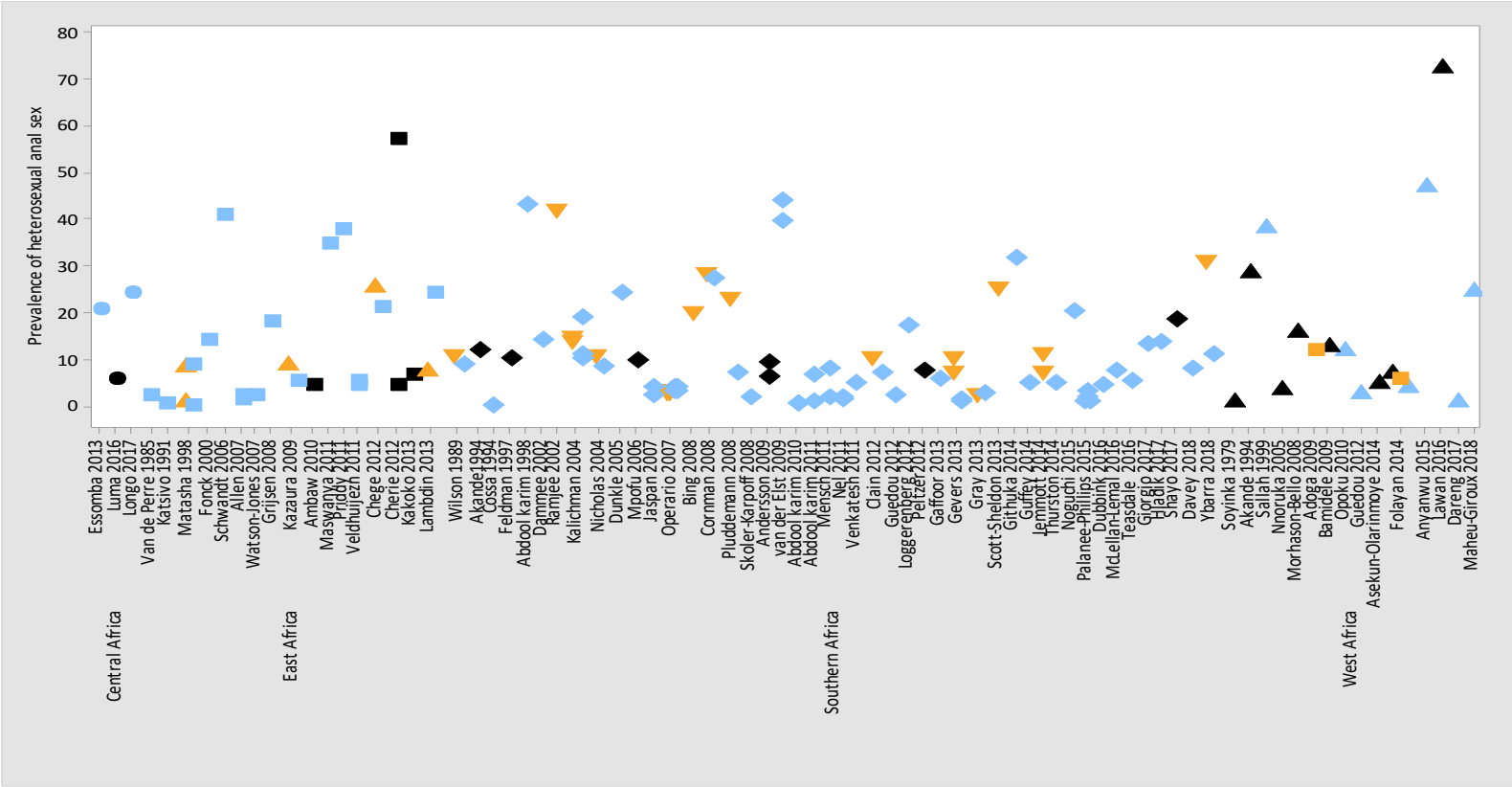
Multiple data points for the same author and year referred to disaggregated data by: ***Educational level*** *(Matasha et al 1998);* ***Gender*** *(Wilson et al 1989; Matasha et al 1998; Tengia-Kessy et al 1998; Nicholas et al 2004; Operario et al 2007; Pluddemann et al 2008; Kazaura et al 2009; Chege et al 2012; Gever et al 2013; Vogt et al 2013; and Folayan et al 2014); Mbulawa et al 2014; Ybara et al 2018;* ***Range value*** *(Kerwin et al 2014);* ***Reporting periods*** *(Gever et al 2013; Cherie et al 2012 and Folayan et al 2014);* ***Sexual partners*** *(Anderson et al 2009);* ***Study sites*** *(Akande 1994; Nell et al 2011); A study by Okafor et al 2005 that presented combined prevalence of oral and anal sex as a single estimate point was excluded in this graph. FSWs: Female sex workers; KAP: Key affected Population. Status – Type of oral sexual practice*

Supplementary Figure 3: Prevalence of oral sex by risk of bias



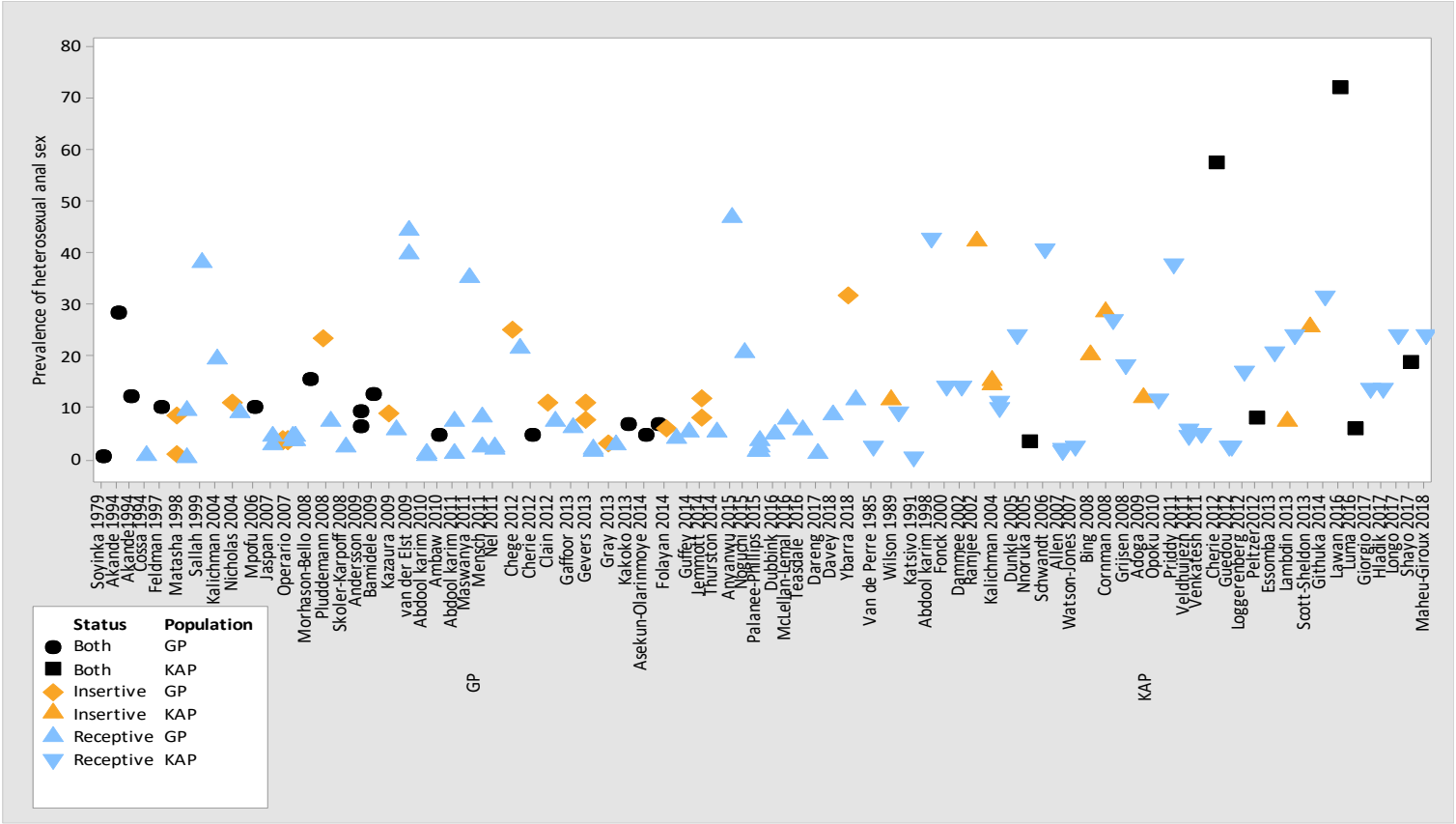
Multiple data points for the same author and year referred to disaggregated data by: ***Educational level*** *(Matasha et al 1998);* ***Gender*** *(Wilson et al 1989; Matasha et al 1998; Tengia-Kessy et al 1998; Nicholas et al 2004; Operario et al 2007; Pluddemann et al 2008; Kazaura et al 2009; Chege et al 2012; Gever et al 2013; Vogt et al 2013; and Folayan et al 2014); Mbulawa et al 2014; Ybara et al 2018;* ***Range value*** *(Kerwin et al 2014);* ***Reporting periods*** *(Gever et al 2013; Cherie et al 2012 and Folayan et al 2014);* ***Sexual partners*** *(Anderson et al 2009);* ***Study sites*** *(Akande 1994; Nell et al 2011); A study by Okafor et al 2005 that presented combined prevalence of oral and anal sex as a single estimate point was excluded in this graph. FSWs: Female sex workers; KAP: Key affected Population. Status – Type of oral sexual practice*

Supplementary Figure 4: Prevalence of anal sex by sub-region



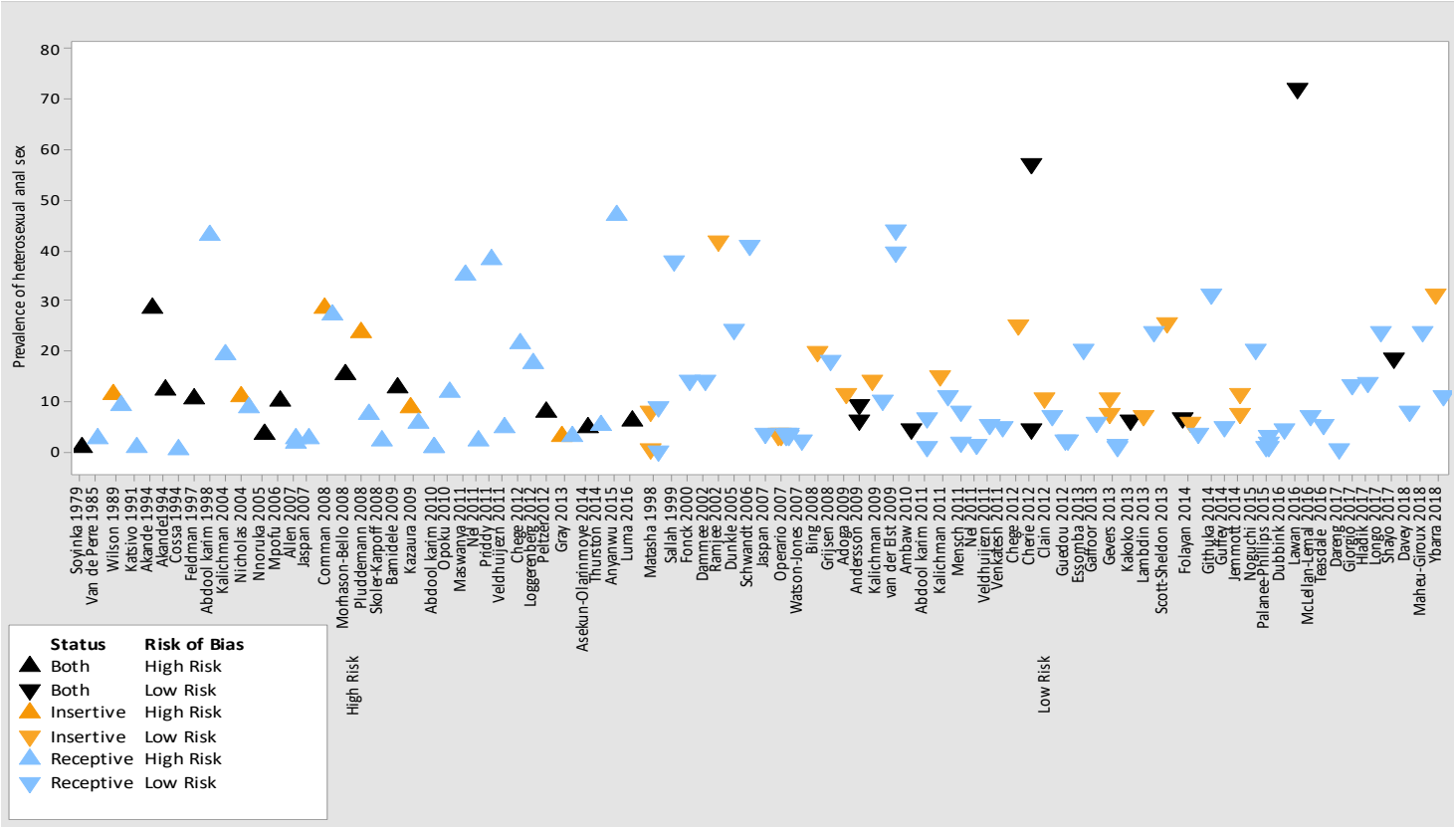
Multiple data points for the same author and year referred to disaggregated data by: ***Data collection methods*** *(Allen et al 2007; van der Est et al 2009; Mensch et al 2011);* ***Educational level*** *(Matasha et al 1998);* ***Gender*** *(Operario et al 2007; Folayan et al 2014)* ***Study site*** *(Akande 1994; Abdool Karim et al 2010; Veldhuijezn et al 2011; AbdulKarim et al 2011; Nell et al 2011; Palanee-Philips et al 2015);* ***Sexual partners*** *(Anderson et al 2009; Jemmot et al 2014);* ***Reporting period*** *(Cherie et al 2012; Gever et al 2013; Folayan et al 2014); A study by Okafor et al 2005 that presented combined prevalence of oral and anal sex as a single estimate point was excluded in this graph. FSWs: Female sex workers; KAP: Key affected Population. Status – Type of anal sexual practice*

Supplementary Figure 5: Prevalence of anal sex by population category



Multiple data points for the same author and year referred to disaggregated data by: ***Data collection methods*** *(Allen et al 2007; van der Est et al 2009; Mensch et al 2011);* ***Educational level*** *(Matasha et al 1998);* ***Gender*** *(Operario et al 2007; Folayan et al 2014)* ***Study site*** *(Akande 1994; Abdool Karim et al 2010; Veldhuijezn et al 2011; AbdulKarim et al 2011; Nell et al 2011; Palanee-Philips et al 2015);* ***Sexual partners*** *(Anderson et al 2009; Jemmot et al 2014);* ***Reporting period*** *(Cherie et al 2012; Gever et al 2013; Folayan et al 2014); A study by Okafor et al 2005 that presented combined prevalence of oral and anal sex as a single estimate point was excluded in this graph. FSWs: Female sex workers; KAP: Key affected Population. Status – Type of anal sexual practice*

Supplementary Figure 6: Prevalence of anal sex by risk of bias



Multiple data points for the same author and year referred to disaggregated data by: ***Data collection methods*** *(Allen et al 2007; van der Est et al 2009; Mensch et al 2011);* ***Educational level*** *(Matasha et al 1998);* ***Gender*** *(Operario et al 2007; Folayan et al 2014)* ***Study site*** *(Akande 1994; Abdool Karim et al 2010; Veldhuijezn et al 2011; AbdulKarim et al 2011; Nell et al 2011; Palanee-Philips et al 2015);* ***Sexual partners*** *(Anderson et al 2009; Jemmot et al 2014);* ***Reporting period*** *(Cherie et al 2012; Gever et al 2013; Folayan et al 2014); A study by Okafor et al 2005 that presented combined prevalence of oral and anal sex as a single estimate point was excluded in this graph. FSWs: Female sex workers; KAP: Key affected Population. Status – Type of anal sexual practice*

2.5. SIGNIFICANCE OF THE SYSTEMATIC REVIEW FOR THE THESIS

The outcome of this systematic review shows that oral and anal sexual behaviours are common, but data collected are difficult to synthesise and interpret because of the heterogenous design of published studies. For example, most published studies from Nigeria in this review did not provide a clear definition of oral and anal sexual behaviours. It is therefore difficult to ascertain whether participants understood the questions that were asked on oral and anal sexual practices, and how their response varied across different populations. Apart from the possibility of incorrect interpretation of questions, lack of operational definitions of these sexual behaviours may also make comparisons of research findings across studies challenging. Despite these limitations, some studies provided clear definitions of oral and anal sex including sexual behaviour roles and associated risk factors, which served as a useful guide for the design of tools on sexual behaviours for the qualitative and quantitative aspects of SHINI study. Furthermore, it was also clear from this review that oral and anal sexual behaviours have local or colloquial terms which might connote different meaning or elicit varied responses, and interpretations of these terms sometimes shape people's attitude in the community. This explored in more detail among the SHINI study population with formative qualitative research in Chapter 3.

CHAPTER 3: PERCEPTIONS, INTERPRETATIONS, TERMINOLOGIES, AND ATTITUDE OF ADOLESCENTS AND ADULTS TOWARDS HETEROSEXUAL ORAL AND ANAL SEX IN IBADAN, NIGERIA

3.1. BACKGROUND INFORMATION

Emerging data from SSA described in the systematic review in Chapter 2 showed that heterosexual oral and anal sex behaviours are common among men and women in the general population and in key affected populations such as FSWs, long distance drivers and women working in bars and entertainment centres [157, 252, 282, 320, 331]. However, there are limited qualitative research publications that seek to understand knowledge, perceptions and interpretations of these sexual behaviours in SSA. Although there were virtually no published qualitative data on oral sex in SSA, there were some qualitative studies published on heterosexual anal sex, mostly from Southern [301, 322, 323] and East African countries [302, 304, 320]. None of the qualitative studies on oral and anal sex in the systematic review was conducted in Nigeria. The qualitative studies generally focused on understanding terminologies, perceptions, and interpretations of anal sex [301, 304, 322, 323]. For example, anal sex was misunderstood by people in some communities to be vaginal sex from behind[301], or was perceived to be foreign to African culture and to be exclusive to homosexuals[301, 304]. In five qualitative studies [290, 300, 303, 322, 323], anal sex was considered to be too sensitive a topic to be mentioned openly, and individuals involved in such practices often use slang words or other terminologies to describe it.

The systematic review in Chapter 2 also documented a few studies that provided clear definitions of oral and anal sex; the majority of studies did not[157]. However, it is not clear from the review whether participants preferred the use of simple definitions or local or colloquial names or slang terms for oral and anal sex. It is important to use appropriate terminologies to frame questions in order to elicit correct response from participants without causing any provocation or embarrassment [358]. Given that sexual behaviours are not openly discussed and have many local terminologies, there is also the risk that individuals will misunderstand questions that are asked regarding these sexual behaviours [358-360]. As part of this PhD, qualitative research was conducted amongst different groups of people in some communities in Ibadan, Nigeria to prepare for cross-sectional surveys to document the

prevalence of and risk factors for HPV infection in adolescent and adult females and FSWs. Specifically, this qualitative study explored knowledge and perceptions, interpretations, local terminologies, motivations and beliefs around potential health risks associated with different types of sexual behaviours, with specific attention on heterosexual oral and anal sex.

3.2. METHODS

The formative qualitative research presented in this chapter was designed to help develop a culturally acceptable questionnaire tool that could be used in the SHINI cross-sectional study presented in Chapters 4 and 5.

3.2.1 Study design and population

The qualitative study used focus group discussion (FGD) and in-depth interview (IDI) data collection techniques to obtain information from male and female older adolescents (≥18 years) and adults in the community and brothels in Ibadan metropolis. The younger adolescents (<18 years) were excluded because of the logistic challenge of securing consent from a minor and ethical implication to the study. The FGDs were conducted to initiate discussions about knowledge, definitions/meanings, and motivations for different sexual behaviours among homogenous participants (***Annex 3.1 – topic guides for the FGD***). Specifically, the FGDs explored participants' perceptions of oral and anal sex including motivations, meanings, interpretations, associated stigma, and perceived health related problems associated with these sexual acts. The IDIs sought information on personal experiences of participants concerning oral and anal sex, including motivations for engaging in these sexual acts and any perceived associated health risks (***Annex 3.2 – topic guides for the IDI***).

Two urban LGAs, Ibadan Southwest and Ibadan Southeast, were purposively selected for the qualitative research because of the relatively high population of youths aged 18 years and above and adults up to 45 years of age the presence of social activity points such as hotels, bars, pub and clubs, cinema houses and brothels. A list of mapped brothels was provided by the Society for Family Health (SFH), a non-governmental organization that has been conducting reproductive health programmes among FSWs for decades (http://www.sfhnigeria.org). Out of the mapped brothels, the four brothels with the highest number of FSWs were selected from two LGAs.

The study purposively selected male and female adolescents and adults in the community as a sample from the general population and brothel-based FSWs (18-45 years) as a sample of the key affected population group. The general population sample consist of two age groups: (i) adolescents and young adults (18-25 years) and (ii) older adults (26-45 years).

3.2.2 Study procedures

3.2.2.1 Recruitment of study participants for Focus Group Discussion

Potential participants among the general population and FSWs were recruited separately by gender-matched trained research assistants. The FGD participants from the general population were recruited in the community from tertiary educational establishments, vocational centers, youth clubs, markets, artisan people and other institutions/facilities in both LGAs to provide a wide perspective on the research topic. Research assistants informed potential participants about the objectives of the study and this was corroborated with an information leaflet that explained the aims and procedures of the study. The contact details of potential FGD and IDI participants that agreed to join the study were recorded for follow-up.

In each LGA, separate FGDs were conducted for male and female participants in the general populations. Within each gender sub-group, separate FGDs were conducted for the married and unmarried participants. There were also separate FGDs for participants that spoke English or spoke only Yoruba (Table 3.1). The average number of participants per session of FGD was 6-10 people.

The FSWs living and/or working in the selected brothels were invited to take part in one of two FGDs (one in each LGA) (Table 3.3). The map of local brothels provided by the Society for Family Health was updated by two teams of volunteer brothel gatekeepers and an Assistant Director in the Oyo State Ministry of Health who coordinated public health interventions in the key affected populations. Two members of the research team visited the selected brothels and met with the managers and the chairladies of the FSWs working in the brothels to discuss the research objectives. The brothel manager or chairlady endorsed the letter of invitation to conduct the study in their brothel. After securing written approval from the brothel leadership, the female research assistants individually discussed the objectives of the

study with the FSWs and also gave out study information leaflets. Those that agreed to participate were enrolled in the study.

3.2.2.2 Recruitment of study participants for In-depth Interviews

Participants among the general population and FSWs that participated in FGDs and other interested people in the community and brothels who were willing to discuss the research topic further were invited for IDIs. They were informed that they would be asked about their sexual behaviours. The potential participants were individually informed about the IDI stage of the study, and each of them was given an information leaflet about the study to ensure that they had a clear understanding of the study and of their participation in it. Thereafter, those willing to participate were scheduled for the interview by a gender matched research assistant.

The IDI participants in the general population were recruited from the two LGAs and the recruitment covered gender, age-group, marital status and educational status. The interview was conducted in English or Yoruba. The detail of the sampling matrix for the recruitment of study participants is in tables 3.2 and 3.3.

3.2.3. Design of Topic Guides, Training and Data Collection Process

3.2.3.1. Research Team, Training and Pilot study

The principal investigator (IMB) developed topic guides for FGDs and IDIs following a review of the literature on different sexual behaviours including oral and anal sex. The design of the topic guides was supervised by KM, DWJ and SCF. The topic guides (***Annexes 3.1 and 3.2***) covered knowledge of different sexual behaviours, including oral and anal sexual acts, motivations, terminologies, interpretations, and experiences of practicing vaginal, oral and anal sexual acts. Information on stigma and health risks associated with these sexual behaviours was also discussed. Six research assistants (three male and three female) who had tertiary education, who spoke English, Yoruba and 'pidgin' English fluently, and who had previous experience in social science research were engaged to serve as recruiters, moderators or interviewers as well as note-keepers

Before the data was collected, IMB and a social scientist in Nigeria conducted a week of intensive training on qualitative research for the research assistants. The training involved didactic lectures, interactive discussions and role play scenarios on how to conduct FGDs and

IDIs using the topic guides. A pilot study was conducted at Yemetu community to pre-test the topic guides to elicit information on the study objectives. One FGD and two IDIs were conducted. IMB reviewed the three pilot study transcripts to assess whether all the key issues in the topic guides were covered. A one-day follow-up meeting was held with the research team by IMB to discuss feedback from the pilot tests and to finalise the strategy for the conduction of the qualitative study.

3.2.3.2. Data Collection Process

During FGDs, a trained gender-matched moderator and a note-taker facilitated the sessions. Written, informed consent was obtained from individual potential participants before each session began ***(Annexes 3.3 and 3.4 – Consent for the qualitative study***). The consent form also covered permission to record and analyse results and to publish the research findings. After a brief introduction, participants that gave consent to participate in the study were assigned numbers for identification (R1, R2…Rn). The moderator began with setting the stage by providing some ground rules, including telling participants that no comments or expressed views would be taken as a right or a wrong response. Most FGDs were conducted in English. Participants with no formal education were grouped together and their FGDs were conducted in Yoruba while the FGDs among FSWs were conducted in "pidgin" English.

The moderator introduced each issue in the topic guides for discussion, allowing participants to present their views openly and ensured that no participant dominated the session. Each participant was encouraged to express his/her views freely. Participants were assured that the information provided by them would not be used against them and their identity would not be revealed at any stage of the research process. The moderator probed for specific issues that were not covered by participants. Demographic data pertaining to each of the participants were collected individually at the end of each FGD session.

IDIs were conducted in the participant's preferred venue. A gender matched research assistant conducted each interview. The choice of language that was used to conduct an IDI was dictated by the participant's preference. The transcript and recording of individual participants was identified by their age and marital status. Each FGD session and each IDI was audio-recorded and these generally lasted between 40-65 minutes. The note taker documented the key findings from each FGD and IDI session, including the non-verbal cues

that were observed. The data collection took place between 22nd August 2016 and 14th December 2016.

3.2.4. Data management and analysis

All data collected (electronic and hard copy) were kept in a locked cabinet inside IMB's office. Audio files were transcribed verbatim and this was supported with information from field notes by IMB and two hired research assistants. Yoruba language and "pidgin" English transcripts were translated to by the two hired research assistants who had many years' experience in translating Yoruba to English. Data quality checks were done through reading of all transcripts by IMB. KM and AJ read some randomly selected transcripts of FGD and IDI. The data were imported into Nvivo 11.0 Pro software (QSR International Pty Ltd. Cardigan UK) for coding.

At the first stage, three coders (IMB and two other independent persons experienced in Nvivo software (QSR International Pty Ltd. Cardigan UK) for coding) generated the preliminary (parent) codes for review and discussion. Two experienced qualitative researchers (KM and AJ) reviewed the codes and offered suggestions to improve on the emerging parent codes. IMB and two other coders generated child codes from further reading of transcripts and discussions. Information from the memos of the FGDs and IDIs and the reflective diaries of coding were used to further refine the emergent themes through an iterative and inductive process[361]. The links between emerged themes were explored to reveal contextual meaning of the final themes that were identified. The analysis was conducted using a thematic content analysis framework[362]. The identified themes from the FGDs and IDIs were summarized with headings and key messages were amplified using direct quotes from the study participants. The descriptive statistics of the participants were presented.

3.2.4 Ethical considerations

Ethical approvals for the study were obtained from the ethical committees of the London School of Hygiene and Tropical Medicine, London (LSHTM 9736-3); the University of Ibadan/the University College Hospital, Ibadan (UI/EC/16/005); and the Oyo State Government (AD13/479/712) in Nigeria ***(Annex 3.5).*** The research assistants explained the objectives of the study to the potential participants and gave each of them a copy of the information leaflet. Written consent was obtained before data collection and a witnessed

consent was obtained from those that could not read or write (illiterate) ***(Annexes 3.3 and 3.4)***. The witness was selected by individual participants. Participants were assured of confidentiality, and each of them was given condoms, a toothbrush, toothpaste and a bar of bathing soap as well as light refreshments at the end of the FGD or IDI session.

Table 3. 1: Sampling matrix for the community FGDs, and selected socio-demographics of the participants

Study site and type of data collection	Educational Status	Population sub-group	Gender	Mean age in years (range)	Total number of participants
Southeast LGA FGDs	Formal education	Adolescent and young adult (unmarried)	Male	20.9 (18 – 25)	8
			Female	20.8 (19 – 25)	6
		Adults (married)	Male	34.8 (28 – 42)	8
			Female	37.3 (28 – 45)	7
	No formal education	Adolescent and young adult (unmarried)	Male	21.9 (18 – 25)	9
			Female	20.9 (18 – 24)	7
		Adults (married)	Male	40.4 (32 – 45)	8
			Female	38.2 (30 – 45)	10
Southwest LGA FGDs	Formal education	Adolescent and young adult (unmarried)	Male	19.7 (18 – 22)	7
			Female	19.3 (18 – 25)	10
		Adults (married)	Male	41.1 (33 – 45)	7
			Female	40.4 (33 – 45)	8
	Formal education	Adolescent and young adult (unmarried)	Male	20.8 (18 – 25)	6
			Female	22.0 (20 – 24)	7
		Adults (married)	Male	36.6 (26 – 45)	10
			Female	37.8 (28 – 45)	10

FGD -focus group discussion; IDI- In-depth-interview; LGA – Local government area; Adolescent and young adult population – 18-25 years; Adult population – 26-45years; One FGD was conducted for each population group

Table 3. 2: Sampling matrix for the community IDIs, and selected socio-demographics of the participants

Study site and Type of data collection	Educational Status	Population sub-group	Gender	Age or Mean age in years (range)	Total number of participants
Southeast LGA IDIs	Formal education	Adolescent and young adult (unmarried)	Male	22.0 (19 – 24)	3
			Female	20.0	1
		Adults (married)	Male	34.0 (28 – 42)	3
			Female	33.0 (30 – 36)	2
	No formal education	Adolescent and young adult (unmarried)	Male	21.7 (18 – 24)	3
			Female	21.0 (19 – 23)	2
		Adults (married)	Male	37.7 (28 – 45)	3
			Female	36.0 (32 – 40)	2
Southwest LGA IDIs	Formal education	Adolescent and young adult (unmarried)	Male	20.7 (18 – 22)	3
			Female	22.0	1
		Adults (married)	Male	33.7 (31 – 37)	3
			Female	43.0 (40 – 45)	3
	No formal education	Adolescent and young adult (unmarried)	Male	22.7 (21 – 25)	3
			Female	23.7 (23 – 24)	3
		Adults (married)	Male	32.7 (29 – 36)	3
			Female	30.0	1

FGD -focus group discussion; IDI- In-depth-interview; LGA – Local government area; Adolescent and young adult population – 18-25 years; Adult population – 26-45years

Table 3.3: Sampling matrix for the brothel FGDs and IDIs, and selected socio-demographics of the participants

Study site	Type of data collection	Marital Status	Mean age in years (range)	Total number of participants
Southeast LGA	FGD	Married	30.0	1
		Unmarried[1]	26.3 (20 – 34)	9
	IDI	Married	32.0	1
		Unmarried[2]	35.0	1
Southwest LGA	FGD	Married	30.0	1
		Unmarried[3]	26.6 (21 – 29)	8
	IDI	Married	NA	-
		Unmarried[4]	26.3 (23 – 29)	3

FGD -focus group discussion; IDI- In-depth-interview; LGA – Local government area; NA – Not available (Declined to give her age).
1-single – 6FSWs and 3 ; 2-single;3-single-6 FSWs and divorced – 2 FSWs; 4-single- 2FSWs and divorced – 1FSW

3.3. RESULTS

3.3.1 Sociodemographic characteristics of participants

A total of 18 FGDs and 44 IDIs were conducted in the two LGAs: 16 FGDs (128 participants) and 39 IDIs were among the general population; and two FGDs (19 participants) and five IDIs were conducted among the FSWs (Table 3.1, 3.2, 3.3). Of the eight FGDs conducted among adolescents and young adults who were unmarried, four each were conducted among male and females. Another four FGDs each were conducted among married men and women. Nineteen adolescents and young adults had IDIs, twelve were males while seven were females. Twelve married men and eight married women were interviewed. Fourteen participants in the FGD were also recruited for the IDIs (12 in the general population – 8 females and 4 males – and two among the FSWs). The summary description of selected socio-demographics are presented in tables 3.1, 3.2 and 3.3

3.3.2 Knowledge of oral and anal sexual practice

3.3.2.1. Knowledge of oral sex

Most of the FGD and IDI participants had heard about oral sex; however, not all of them were able to give accurate and complete definitions of the behaviour. Generally, most participants described oral sex as a form of sexual activity involving the use of the mouth and/or tongue. The most common description of oral sex given by both male and female participants was oral stimulation of the penile shaft by a female.

During one of the FGDs, a young man gave a complete definition of oral sex as follows:

> "what I knew of oral sex is when a man or woman is using their tongue or mouth to stimulate either the vulva or vagina or penis. This is my own understanding" [Unmarried male adolescent with no formal education, Ibadan southwest FGD, aged 18 years, R3]

A male adolescent gave this explanation when he was asked to explain the meaning of oral sex:

> "I will say oral sex is like having sex, it is like hmm, a guy is having sex with a girl by using his mouth or lips to lick the vagina" [Unmarried male adolescent with formal education, Ibadan southwest IDI, aged 18 years]

Most participants described oral sex from the perspective of heterosexual relationships. Some participants described oral sex as ejaculation of seminal fluid into the mouth of a woman, the exchange of open mouth-to-mouth kisses (deep kisses) between two lovers, breast fondling with the mouth, or licking of the anal verge of a sexual partner ("rimming"). There was also a description by two participants that oral sex can be an "unprotected penile-vaginal sex" or the exchange of erotic messages between two sexual partners during a telephone conversation.

Few participants mentioned that men and women who are involved in same sex relationships could also practice oral sex. In one FGD, a married man explained that oral sex could be practiced between women that are in the same sexual relationships.

> "Oral sex means that some could use their tongue, insert it into the vagina or the vulva of the baby *("loving woman or lady"*) and start licking the vulva. It could be man to woman, woman to woman, and that's when they say that the person is having oral sex [Married man with formal education, Ibadan southeast FGD, aged 45 years, R1]

Oral sex was also regarded as a modern method of foreplay before engaging in penile-vaginal sex. A female participant described oral sex as part of the initial "romance" before penile-vaginal sex.

> "For a female, who is also not in the mood when she and her boyfriend are together, in this case, when they are romancing themselves, the man will put his mouth on the woman's vagina to make her to be in the mood, then he might also put her breast in his mouth and suck it" [Unmarried female adolescent with no formal education, Ibadan southeast FGD, aged 18 years, R3]

A married man compared how couples in former and modern times engaged in sex. He believed that couples nowadays engaged in oral sex as a form of foreplay to stimulate themselves to achieve orgasm.

> "In the olden days, the husband will just lie on top of the wife during sex and there will be no adjustment until they are through. But nowadays, the husband can tell the wife to first stimulate his penis with her mouth before inserting it into her vagina, and he will enjoy it until he ejaculates" [Married male adult with no formal education, Ibadan southeast FGD, aged 43 years, R7].

During one of the FGDs among the FSWs, a participant gave insights into how oral sex is performed. She described oral sex as the licking or sucking of the male or female's genital organs.

> "Oral sex involves licking and/or sucking of a vagina and licking of the penis…" [Female sex worker, Ibadan southeast FGD, aged 29 years, R1]

Another FSW gave a detailed description of the way oral sex should be performed on a male sexual partner to give him maximum pleasure and enhance orgasm, and possibly to avoid injury during the process.

> "you hold the prick (penis) and put it inside your mouth, you suck it, you make sure that your teeth is not biting the prick (penis) because if you are biting the prick (penis) the guy will not enjoy it. Just make sure that you suck the prick (penis) with your tongue and your lips so that the guy will enjoy it" [Female sex worker, Ibadan southeast IDI, aged 27 years]

3.3.2.2. Sources of information on oral sex

Both adolescents and adults and sex workers openly shared information about where they learnt oral sex for the first time. The most frequently mentioned sources of information of oral sex by participants from the general population were watching movies including 'porn', followed by learning from sexual partners. This is in contrast to most FSWs, who said they learnt oral sex from their sexual partners followed by watching 'porn' movies. Other sources of information that were mentioned included school mates, neighbourhood friends, personal adventures, musical videos and other social media platforms. According to one married woman during a FGD, some people watched sexually explicit movies that contained oral sex at some point in their lives. She described how her husband used a 'porn' movie at home to convince her to learn about oral sex.

> "We all learnt oral sex from blue film. We have been watching such movies inside. My husband bought one blue (pornographic) film, and said you, you will just sleep "borogidi" (like log of wood) (*laughs by all participants*). He said you will just sleep and your body will not move. so, he brought one blue film. When I watched the film, I screamed, said ehnnn!!! I cannot even do it and I don't want to see this film inside my house again. I saw a lot of oral sex, like a lady sucking the penis of a man and thereafter, two men were sucking her at the same time, one was sucking her breast and another sucking her genitals (*laughs by everyone*) …" [Married female adult with formal education, Ibadan southwest FGD, aged 39 years, R3]

At one of the IDI sessions, a FSW explained how she learnt oral sex through a customer's request and through discussions with her friends. oral sex is performed because of the financial benefits.

> "I learnt about oral sex from friends and from my customers; some men do come here and request for oral sex. You will do it for them based on the money you are looking for" [Female sex worker, Ibadan southeast IDI, aged 23 years]

A married woman also shared a similar experience of learning oral sex from a a friend that narrated her experience with her sexual partner.

> " I heard about it from a friend that we were together, she has a boyfriend, they both went out, when they came back, she says the film she watched today is quite surprising, that his sperm didn't come out after the sex and he asked her to put his manhood in her mouth and be sucking it…" [Married female adult with no formal education, Ibadan southeast IDI, aged 40 years]

A sex worker described an unusual source of information for learning sexual behaviour; that there is a possibility of people divulging previous sexual practices during a brawl to make jest of each other. A sex worker shared her experience as follows:

> "I learnt about oral sex when I became mature. I started watching films like blue films on the television. However, I started to see and hear about it when I joined this business. I heard about it when there was a misunderstanding between two jolly friends. They were accusing each other of engaging in oral practice while I was in Lagos". [Female sex worker, Ibadan southwest IDI, aged 35 years,]

There were a few participants, mostly during FGDs among adolescents with no formal education, that had not heard or learnt about oral sex. For example, a female adolescent said that *"I have not heard of oral sex before"* and another female adolescent said that "*I have not been taught on how to perform oral sex".* Both responses elicited laughter from other participants.

3.3.2.3. Knowledge of anal sex

Knowledge was assessed by asking participants to define the term *anal sex* according to their own understanding. Although not all participants had heard about anal sex, most were able to define anal sex as a form of sexual intercourse that involves the anus or anal cavity. Male adolescents, young adults and the FSWs were able to offer a more comprehensive explanation of the meaning of anal sex compared with adult participants. Some participants

described anal sex as a sexual relationship that is more common among MSM, as described by an adolescent in an FGD.

> "Anal sex basically happens among men to men, it is more common among men who used to have sex with men. They must perform anal sex to satisfy themselves" [Unmarried male adolescent with no formal education, Ibadan southeast FGD, aged 18 years, R3]

At the same FGD session, another participant corroborated that since men do not have a vaginal opening, they can only engage in anal sex between themselves.

> "A man can insert his penis into the anus of another man since there is no vagina." [Unmarried male adolescent with no formal education, Ibadan southeast FGD, aged 19 years, R2]

However, other participants felt that anal sexual acts are usually practiced between men and women. A more detailed explanation of anal sex was given by some participants as a penile-anal sex between two men or a man and woman or oral-anal sex between two women. Anal sex was also described as 'penile-vaginal sex' from behind the woman.

Some participants were aware that anal sex could happen in both same-sex and heterosexual relationships. For example, a married man correctly defined anal sex to be penile penetration of the anal canal of a man or a woman.

> "..the anal simply means when the man's penis is erect, you insert it into the anus of either a man or woman…."[Married male adult with formal education, Ibadan southeast FGD, aged 33 years, R8]

Another woman gave a similar description of anal sex based on hearsay from other people.

> "..they said a man will put his penis at the anus of maybe a man or a woman, so they would now put the penis inside the anus.." [Married female adult with formal education, Ibadan southeast FGD, aged 44 years, R3].

Some adolescents and young adults during one of the discussions echoed that anal sex is practiced among people that are involved in homosexual and heterosexual relationships. Some adolescents described heterosexual penile-anal sex to be more pleasurable than penile-vaginal sex. Male adolescents felt that anal sex is pleasant while the females felt otherwise. This perspective was summarised by a young man during a FGD.

> "from my own view, I think anal sex means having sex through the anus and it is very common to people that are called gay. Some guys do practice anal sex with some

> ladies because I think they enjoyed it more than vaginal sex [Unmarried male young adult with formal education, Ibadan southwest FGD, aged 22 years, R4].

A married female participant said:

> "The experience I saw was in the pornographic films when the man inserted his penis into the anus of the woman and started having sex. I cannot say how they enjoyed themselves [Married female with no formal education, Ibadan southeast FGD, aged 45 years, R4].

Some adolescents and young adults with no formal education believed that it was impossible for anyone to insert a penis into the anus of another person, describing such sexual acts as "barbaric" or unacceptable.

3.3.2.4. Sources of information on anal sex

In a similar way to how participants described learning about oral sex, most participants reported learning about anal sex from watching pornography movies and other sexually explicit movies, personal adventure, sexual partners and friends. Adolescents and young adult participants mentioned pornographic movies ("porn") and other media platforms more often than older adult participants. Most FSWs learnt about anal sex when they joined the sex work business or from clients that requested anal sex. Unlike the adolescents/young adults, the adult participants did not freely share their source of information on anal sex. An adolescent described how they used to learn different sexual behaviours, including penile-anal sex, from watching pornographic movies. She also added that these movies might have accounted for the changing sexual behaviours between the older people and young people.

> "..Before now, during the time of our mothers and fathers, they don't engage in such (anal sex), but now that everybody is now watching blue film, and they see how everything is done, they also want to do the same….." [Unmarried female young adult with no formal education, Ibadan southeast FGD, aged 20 years, R3]

A man also shared the influence of pornography as a source of learning anal sex during an interview. He considered watching pornographic films as a negative influence on the sexual habits of people.

> "…70% are due to negative influence, I used to watch pornography videos. I developed much interest in these sexual activities (oral and anal sex), which is not good at all, and it is against the will of God, so watching pornography video is dangerous" [Married male adult with formal education, IDI, aged 28 years]

A male adult participant described that he heard about anal sex while trying to settle a quarrel between two young boys in the community.

> "Concerning the male to male sex, something happened to one of my people, a boy called another boy for sex but the other boy disagreed leading to a serious disagreement. The matter was taken to the landlord association meeting. The boys were warned seriously not to try anything funny again". [Married male adult with no formal education, Ibadan southeast FGD, aged 35 years, R3]

Unlike the general population participants, most FSWs learnt anal sex from their clients at the brothel. Most sex workers said that they had had clients or boyfriends (non-fee-paying partners) requesting anal sex. According to a sex worker:

> "I have one customer that said that he used to have a friend that "fuck" (have sex with) him from the anus. He used to pay me well for anal sex but he is a man but wears a woman clothes" [Female sex worker, Ibadan southeast FGD, aged 20 years, R2]

A sex worker described the way she first heard of anal sex after joining the sex work business:

> "Yes, of course. Some people will come and request that they want to have it through the anus. In fact, I have never heard of it before until when I found myself in this job…" [Female sex worker, Ibadan southwest FGD, aged 33 years, R4]

3.3.3. Local names and slang terms for oral and anal sex

3.3.3.1. Local names and slang terms for oral sex

The general population participants and FSWs mentioned several local names or slang terms that are used to describe oral sex. These terminologies were broadly categorised into three types, based on the type of oral sexual practice that is performed. Some terms were used when a man gives oral sex to a woman, i.e. when a man/boy uses his tongue, mouth, or lips to touch or stimulate the external genitals of a woman/girl. Examples that were mentioned included 'lick plate', 'clean up', 'wash wash' and 'go south'. Another set of terms described oral sex that is given by a woman or girl to a man or boy i.e. when a woman uses her tongue or mouth to touch or lick or suck the penis. These slang terms were 'blow job (BJ)', 'chop or eat banana or plantain ('dodo'), 'eating carrot', 'hold microphone to sing', 'licking soft sweet stick', 'lollipop', 'suck straw' and 'gbe se enu' (put it in your mouth). The third category were oral sex terms that could be used interchangeably to describe oral sex that is given by man/boy or woman/girl, and these included 'sucking', 'sukky', 'kiss it', 'ice cream', 'yoghurt'

and ‘collabo’. The most frequently mentioned oral sex slang term was ‘blow job’ by both the male and the female participants. The adolescent male participants and female sex workers mentioned more oral sex slang words than the female general population participants. Most female participants were not interested in discussing oral sex slang words, with some of them showing signs of resentment while others were reluctant when the moderator prompted them to give examples. They felt that slang terms were not nice words for describing oral sex.

Adolescents reported often using slang terms to conceal their discussions in the community, especially in the presence of parents or guardians. For example, a male adolescent participant mentioned some of the common oral sex slang words and also added that these are sometimes used to conceal their discussion about oral sex from adults.

> “there is something we call blow job. It means using the mouth to stimulate to help somebody reach climax, to help somebody reach orgasm. if you really want to code it and you don’t want somebody to know what you are talking about, you can call it BJ, yeah, through “BJ” [Unmarried male adolescent with formal education, Ibadan southeast FGD, aged 18 years, R3]

3.3.3.2. Local names or slang terms for anal sex

The participants listed some of the common local names or slang words that are used to describe anal sex in the community, including ‘back side’, ‘bend down and sow’, ‘backyard sex’, ‘chopping from the back’, ‘daudau’ (penile thrusting from behind), ‘doggy style’, ‘gba eyin wole’ (penetration from behind), ‘hanging up’, ‘load from the back’, ‘monkey style’, ‘olosho’ (sex worker’s style), ‘room’, ‘reedemed’, ‘sex through yansh’, ‘shoki’, ‘smash from the back’, ‘table sex’, ‘touching of toe’, ‘wheel barrow’ and ‘yodi (project out your buttock or anus)’. Participants did not categorise penile-anal sex slang terms between homosexual and heterosexual relationships even when they were prompted. Participants did not mention slang terms to describe oral-anal sex (rimming) by participants.

Generally, anal sex slang words were more frequently used by the adolescents and young adults than by the older adults and also by boys/men more than girls/women, and by unmarried more than married participants. The most frequently mentioned slang words to describe anal sex among the general population participants were ‘backside’, and ‘bend and sow’. Anal sex terms were reported as being used to communicate among people in the same

circle (i.e. share a common social status). For example, a young adult participant described how people used to describe an anal sex experience:

> "People often used the expression that "I entered through the back" to refer to anal sex" [Unmarried male young adult with formal education, Ibadan southeast FGD, aged 25 years, R4]

An adult participant offered a detailed explanation of "entering through the back". He differentiated a penile-anal sex from a penile-vaginal sex from behind a woman. The man also advised that "bakashi" (buttocks) could be used to avoid confusing anal sex with vaginal sex. He explained further as follows:

> "….. what I see about those who go through the back is that for instance, [it is not just back], it is the anus, yes, because if it is back, it can be the vagina also, but it is not the vagina we are talking about. We are talking about the place through which the woman defaecates. The man can also say that I gave her from the "bakashi" (buttocks)..." [Married male adult with no formal education, Ibadan southwest FGD, aged 43 years, R7]

Participants also discussed some native Yoruba language slang words to describe anal sex. For example, a male participant used a Yoruba term to describe the anal canal as a room ('mogba oju ibuwo' meaning 'I entered through the opening door') to enter.

> "You see if we are talking about anal sex, we can call it monkey style, monkey style, that was even common some 20 years ago or more than that, if it is through the place where the woman excretes, they can say that, mogba oju ibuwo (enter a room), there is no one that does not know"[Married male adult with no formal education, Ibadan southwest FGD, aged 35 years, R8].

The description of the anus as a room was described during one of the FGD sessions among adolescents and adults. An adolescent female participant corroborated that anal sex slang terms can be likened to a room.

> "When men are discussing among themselves someone can say something like "for me I enter through the anus". Another person can say "for me I entered through the back, "I entered through the room" or "went in through the backyard" [Unmarried female with no formal education, Ibadan southeast FGD, aged 18 years, R3].

3.3.4 Reasons for using slang terms to describe oral and anal sex

Participants gave different reasons for using slang terms to describe oral and anal sex among themselves in the community.

3.3.4.1. Communication between friends

The most common reason for using slang words was to communicate among a group of people. The male adolescents and young adults mostly preferred to use these terms among their cliques. The slang terms were used to tease people about previous sexual activity, to mock ladies that offended them, to display that they were modern or to cover up discussions about oral or anal sex when an older person was around such as their parents or guardians. For example, a young man explained that slang words could be used between friends freely and their parents would not understand the content of their discussion.

> "I think oral sex, if you are in the presence of your parent, the slang term can be used as a cover up when my friends are with me and we want to talk about a girl. What I am trying to say is that there is no way I can say that *I have licked that girl's plate* and my parent will understand" [Unmarried male with formal education, Ibadan southwest FGD, aged 18 years, R3]

An adult participant also added the use of slang words among friends and peers to share their previous sexual experience.

> "Let's say a man has already had done something with a lady, then maybe you want to explain what happened between each other to one of your friends. You may say that the lady that is going has already eaten my banana" [Married male adult with formal education, Ibadan southeast FGD, aged 33 years, R8]

Most FSWs communicate with their male clients during sexual negotiation with slangs. A sex worker gave an example of how clients used slang words to request for oral sex.

> "Some customers will tell you that I want to do clean-up, meaning the type of oral sex where a man licks up a woman's vulva or vagina. Some will say I want to suck you" [Female sex worker, Ibadan southeast FGD, aged 21 years, R4]

Other reasons for using oral sex slang terms include discussion about sexual practices at social gatherings and when friends are teasing each other regarding their previous sexual practices.

3.3.4.2. Show sexual superiority and dexterity

Some participants were of the opinion that male adolescents and young adults usually use slang words to discuss their sexual experience. They also used slang words to show-off to friends when describing their oral and anal sex practice with their female sexual partners or girlfriends. A young adult male participant summarised the way his colleagues used slang words to demonstrate their sexual power and control over their female friends in the community.

> "Guys like to discuss if they had sex with a lady, they considered it to be a pride in their environment. i.e. the lady that sees herself as the biggest girl... So, when a guy is able to have sex with such a girl, the guy will say, I was able to 'nail' that lady, last night. In fact, she gave me BJ (Blow Job). [Unmarried male adolescent with formal education, Ibadan southeast FGD, aged 18 years, R3].

3.3.4.3. Profiling of the brothel clients and people in the community

The ability to use and understand the slang terms for different sexual acts including oral and anal sex is one of the tools that sex workers usually used to differentiate the old from the new customers. The frequent customers of sex workers were called "roskos" while the new customers were called "magas". According to them, new customers were usually billed higher than regular customers. A sex worker offered her own understanding of how clients are profiled in the brothel.

> "Customers that are frequent in the hotel will know and understand slang terms for different sexual styles. There is no way you wouldn't know them in the hotel unless you don't come around" [Female sex worker, Ibadan southeast FGD, aged 29 years, R5]

Another FSW added that the use of slang terms is also common among students and clubbers.

> "I for one, if I hear anybody outside saying he wants to suck or washy-washy, skirt and blouse, plate etc., I will know easily that the person belongs to our team. I will understand without any problem because an outsider may not know that (slang terms), except the clubbers. Some students and clubbers are in the same business ……Also, you know that I can't just get home now and tell my sister that I want to wash; she will only tell me to go and wash either plate or cloth because she will not understand it" [Female sex worker, Ibadan southwest FGD, aged 22 years, R1]

3.3.5. Perceptions and attitude towards using oral and anal sex slang terms

There was a sharp contrast in perspectives among participants on the use of slang or local names to describe types of sexual activities in the community

3.3.5.1. Slang terms are not acceptable

Adult participants considered the use of slang or local names to describe sexual acts as 'very embarrassing'. They warned that such terminologies should not be used at all among religious or decent people. Participants also explained that oral or anal sex slang terms might be

considered offensive to hear. Some participants categorically stated it was not acceptable in the community to openly use 'offensive' slang terms to describe a subject that is already considered sensitive in the community. For example, a female participant added that oral and anal sex slang words would sound embarrassing to people:

> "the slang for oral and anal sex just sounds embarrassing. People can even ask that what kind of slang terms are these? [Married female adult with formal education, Ibadan southwest FGD, aged 36 years, R5].

Adding to the debate of disapproval of slang term in the community, a married man described oral and anal sex slang terms as indecent and that these words are commonly used by 'rascals' and men of high socio-economic class.

> "Slang words are not for only rascal, there are some big men, they love speaking all these foul things, they don't care, they believe they are catching their fun. It is not only the illiterates that say all rubbish things, even some elite are saying it. But for me, whether we like it or not, slang are things that are not acceptable in the whole community" [Married male adult with formal education, Ibadan southwest FGD, aged 39 years, R3].

There was also a concern that the religious people in the community might not be favourably disposed to the use of slang terms to describe oral and anal sexual acts. A male participant said:

> "Sex slang term will be offensive in the midst of the religious people; you cannot utter all those sex slang words in Church or Mosque. But in the midst of the people of the same set mind, you can say whatever you want to say at times, even at the influence of alcohol, you are free, you will be saying many things" [Married male with formal education, Ibadan southeast FGD, aged 33 years, R8].

Some participants warned against using slang words to describe oral and anal sex in the community. They observed that this might elicit negative response from some people in the community. A participant said her friends usually get uncomfortable discussing sex with slang terms:

> "I have a friend that whenever she hears those slang terms about sex, she feels irritated and she is even beside me. She feels irritated. She doesn't like those names like sucking the man's dick (penile shaft)." [Unmarried female with formal education, Ibadan southeast FGD, aged 18 years, R6].

There was also a concern that sexually related slang terms could potentially promote immorality especially among young people.

> ” Sex related slang words are not at acceptable all because it is something that is very bad in the society and most of the younger ones must not be aware of these names. It has even become more rampant in our society that it can” [Unmarried male adolescent with no formal education, Ibadan southeast FGD, aged 19 years, R7]

3.3.5.2. Oral and anal sex slang terms are acceptable to the young people and sex workers

Most educated adolescents and young adults did not have any objection to use of slang words to describe sexual activities including oral and anal sex. They considered slang words as a modern method of communication or expression. Some participants believed that students, clubbers, ‘big-men’ in the society and FSWs commonly used slang word because they found it to be interesting.

During FGD, some participants maintained that the use of slang words is acceptable particularly among those that understand its meaning. According to a young adult participant:

> “Nowadays slang word are very common and if it is used it will not be a strange thing” [Unmarried male adolescent with no formal education, Ibadan southeast FGD, 19 years, R4]

Acceptability of sexually related slang words in the brothel was discussed; participants felt that everyone would accept it. For example, a sex worker said:

> “people use them (sexually related slang) on a daily basis. Customers ask for it now” [Female sex worker, Ibadan southeast FGD, aged 29 years, R5].

3.3.5.3. Slang word may not give clear meaning and interpretation

Generally, most participants agreed that the use of slang words could sometimes be very confusing to those that are not familiar to such terms. They cited examples of some slang words that are used to describe sexual activity which might connote another meaning. For example, a woman during FGD warned that “yodi” in Yoruba, a known slang word for anal sex could also suggest presence of haemorrhoids:

> "Yodi - projecting of the buttock or anus - is a common slang term that has different meaning. It can mean pile (haemorrhoids) and it can also mean big buttocks. So do not use the slang term” [Married female adult with formal education, Ibadan southwest FGD, aged 44 years, R1].

During another FGD, a man explained that the meaning of slang terms for different sexual activities is not universal but specific for certain groups of people. This would require anyone that is interested to learn the meaning of such slang terms to join the clique. A youth during FGD said:

> "You see people have different caucus, and their peculiar slang words, no matter how wayward the person is, they will not get what you are saying, the way my friends and I will describe the vagina is different from what others will say in their own caucus, if there are people who don't know us, they won't understand and it is the same reason outsiders will not understand" [Unmarried male adult with no formal education, Ibadan southwest FGD, aged 25 years, R4]

Although most adolescents and young adults and FSWs knew the meaning of different slang words for oral and anal sex, they advised against using such words to frame research questions about oral or anal sex. They believed that slang words could be ambiguous, might not elicit appropriate responses, and might provoke negative responses from interviewees/participants. However, most participants were of the view that the use of simple definitions to describe oral and anal sex would be well accepted in the community. A female adolescent participant summarised as follow:

> "I think if you use oral sex, I think everybody knows what oral sex is, everybody knows what sex is rather, so if you use oral sex, it would be more understanding than talking about blow job. What is the meaning of blow job? You will be looking at the questionnaire as if the questionnaire should give you the answer itself. However, if you use oral sex, they will be like ok, it oral sex. You will try and meditate on it and get the answer but if you use these slang words, it may not easy for people to understand the message being passed across" [Unmarried female with formal education Ibadan southeast FGD, aged 21 years, R4].

3.3.6. Motivation for engaging in oral and anal sexual practice

3.3.6.1. Protection of the sexual relationship

Both the general population participants and the FSWs highlighted the importance of protecting sexual relationships as a motivator for engaging in oral and anal sex. Women/girls among the general population and the FSWs explained that they engaged in oral and anal sex to satisfy the request of their sexual partners or clients. This was to prevent them from losing their partners to other competitors. Some participants further added that they sometimes pretend to enjoy the practice for their sexual partners, despite their internal disgust, or that

they practiced oral and anal sex to satisfy their partner's request. The pretence and acceptance of partners' requests for oral and anal sex were mostly discussed by the unmarried women and sex workers. For example, a female young adult explained that the fear of losing a lover might be a strong motivator for learning about and engaging in oral and anal sex:

> "Maybe you are in love with someone, this is what he wants (oral or anal sex) and it is something you can't do no matter what, but because you don't want him to break up with you, the fear of breaking up and losing him will make you do that thing" [Unmarried female young adult with formal education, Ibadan southeast FGD, aged 19 years, R5]

Another female participant noted that women were usually at the receiving end of accepting their partners' requests. She portrayed women in sexual relationships as the weaker sex that needed to accept the sexual requests of her partners in order to keep the relationships.

> "the reason why some people engage in oral or anal sex is that due to the kind of love they have for the person they are dating even if they don't like doing it, they will because they don't want to lose the guy" [Unmarried female adolescent with no formal education, Ibadan southwest FGD, aged 18 years, R3].

There was a sex worker that shared her experience of anal sex during an interview; she recounted how she endured the severe pain in order to allow her sexual partner to have penile-anal sex with her.

> "in the process of having fun (vaginal sex) with my guy, he requested for anal sex, and I said no problem. We used lubricants with all other things we know in the process, but I had to endure the pain to satisfy him " [Female sex worker, Ibadan southeast IDI, aged 27 years]

Another FSW narrated that some of her colleagues would do anything possible to satisfy their clients:

> "Some customers will come and ask you for a sexual style, but if you cannot give such style to them, they will go to another person that can easily render such a good service to them". [Female sex worker, Ibadan southeast FGD, aged 29 years, R5]

Whereas, some married women rejected their husbands' request for oral and anal sex because of the fear of contracting infections or diseases.

> "So as far as I am concern, I don't engage oral sex because even though my husband wants it. I don't accept it from him because he might have other women outside. He

always asked me to suck him, but I usually refuse because I don't want to contact any disease from him" [Married female adult with formal education, Ibadan southwest FGD, aged 36 years, R5].

3.3.6.2. Financial benefit

Financial benefit was another theme that was discussed as one of the drivers for engaging in oral and anal sex among general populations and FSWs. Sex workers mentioned financial reasons more than the general population participants. The desire for money to survive and to be able to attend to personal and family needs were the major drivers among sex workers. Most sex workers observed that they made more money from oral and anal sex than vaginal sex. According to a FSW, the price of engaging in oral or anal sex with a customer at the brothel is about ten times the price for vaginal sex:

> "if a customer requested from me (oral and anal sex), I tell him to pay 10,000 Naira (28USD). If he rejects my price, I will rather tell him to pay 500-1,000 Naira (1.4-2.8USD) to have the normal vaginal sex from the frontal side. I heard that they normally pay 10,000-15,000 Naira (28-41.7USD) for anal sex". [Female sex worker, Ibadan southeast FGD, aged 30 years, R7].

Some FSWs also accused their clients of tempting them with money to accept their requests for oral or anal sex. A participant shared her personal experience of how a customer offered her a huge sum of money to accept his request for oral sex that was difficult to decline. The participant experienced guilty feelings but was consoled by her friend that she should consider the financial benefit.

> "My first experience was when a customer requested for oral sex. I initially declined by telling him that I've never done it before. Then, he said he was going to give me good money if I could cooperate with him. He was the one that taught me….I discussed the different styles I had with the man with my friends. I also discussed the pleasure and my fear…. But they (my friends) said 'forget about it'... it is about money". [Female sex worker, Ibadan southeast IDI, aged 25 years].

Oral and anal sex was also described as a form of transactional sex in the general population in Nigeria. Some participants believed that the rich men lure young girls with money in order to engage in oral and anal sex with them. A female participant in the general population summarised how girls engaged in transactional sex.

> "Some people do engage in oral sex and anal sex because of money, and when these so-called rich men want to enjoy themselves, they will ask our teenage girls to do

> something like this. These girls are usually from broken homes. Poverty is real in our country. Anything they ask them to do, they will do it just to get money to survive themselves" [Married female adult with formal education, Ibadan southeast FGD, aged 44 years, R3]

However, there was a different perspective during a discussion. A male participant explained that some people engaged in anal sex in order to gain spiritual power to protect their wealth.

> "some are using that thing (anal sex) to protect their wealth" [Married male adult with formal education, Ibadan southeast FGD, aged 34 years, R2]

3.3.6.3. Oral and anal sex as an alternative to vaginal sex

The discourse that people engaged in oral and anal sex as an alternative to vaginal sex brought out different perspectives and interpretations from the participants. Most adolescents and young adults observed that some of their colleagues had sexual partners that usually engaged in oral and anal sex instead of vaginal sex in order to protect the virginity of female partners and avoid the embarrassment of unwanted pregnancy.

> "I think anal and oral sex is safer because if you are not really ready to marry, you can have an oral and anal sex. You cannot get an unwanted pregnancy from anal or oral sex" [Unmarried male young adult with formal education, Ibadan southeast FGD, aged 25 years, R4]

A married woman shared her personal experience regarding how she engaged in oral sex to prevent unwanted pregnancy as a young lady for six years before marriage.

> "Concerning oral sex, let me talk about myself. Before I got married, I dated a man for six years and anything we did, there was no condom. The man will tell me that I should lick him - the penis, just for me to avoid pregnancy. I dated the man for good six years without pregnancy. This was what I did before I got married" [Married female adult with formal education, Ibadan southwest FGD, aged 33 years, R2]

Another woman shared her personal experience of using oral sex as a form of family planning in her marriage.

> Oral sex, we have it more than vagina sex. The reason is that I don't want to get pregnant. You know I told you before that I don't do family planning, we don't do anything. My husband prefers flesh to flesh. He does not like to use condom. So the only way to satisfy him sexually and prevent unwanted pregnancy is to give him oral sex" [Married female adult with formal education, Ibadan southeast IDI, aged 36 years]

Most participants suggested that since penile-vaginal sex is not feasible during menstruation, people would engage in alternative sexual acts. For example, a female participant said:

> "with what I have watched maybe when the lady is in her menstruation period, they do oral sex" [Unmarried female young adult with no formal education, Ibadan southwest FGD, aged 22 years]

According to another male participant, a woman could engage in anal sex during her menstrual period.

> "Anal sex can also be done when a female is menstruating" [Unmarried male adolescent with no formal education, Ibadan southeast FGD, aged 18 years, R7].

3.3.6.4. Better sexual pleasure

There was a general belief across the population groups that some people practice oral or anal sex to improve their sexual pleasure. According to some participants, oral sex could easily make a man and woman achieve orgasm to achieve satisfactory sexual pleasure. Similarly, participants also felt that some men preferred penile-anal sex to penile-vaginal sex because it provided more sexual pleasure. They explained that men who engaged in penile-anal sex usually achieved better sexual pleasure due to the tight anal opening compared with penile-vaginal sex penetration.

> "What I see to that is that there are some women that no matter how long you have sex with them through the vagina, they (women) won't feel it like having sex through the anus. The way we do is that we are going to dip our manhood into the anus but that is tighter than the vagina. I have experienced it before" [Unmarried male adult with no formal education, Ibadan southeast FGD aged 21 years, R1]

An adolescent explained that, if the vaginal opening is wide, men with a smaller penile shaft would prefer to have penile-anal sex compared with penile-vaginal sex to achieve better sexual pleasure.

> "if the vagina of a woman is too wide, the man with a small penis cannot enjoy it. He has to resort to anal sex as an alternative [Unmarried male adolescent with no formal education Ibadan southeast FGD, aged 18 years, R1]

A married woman described oral sex as a good foreplay before penile-vaginal sex. She explained that oral sex increases sexual urge, drive and performance during vaginal sex.

> "I think they (men) derive pleasure and enjoyment. when they do such (oral sex), the urge will arouse, and they will be able to perform very well (vagina sex) either with their husband or with the wife. I think enjoyment, pleasure and urge that they derive

from oral sex is the magic" [Married female adult with formal education, Ibadan southwest FGD, 39 years, R3].

3.3.6.5. Adventure

This theme gave insight into how people engaged in oral or anal sex to satisfy their curiosity or to learn or try a new form of sexual behaviour. Adolescents and young adults highlighted adventure as a possible motivation for learning oral and anal sex. Participants also felt that oral and anal sexual behaviours were part of civilisation and modernity.

A married woman said:

> "Before someone start to engage in something (oral or anal sex) to the extent of enjoying it, it is civilization that brings about it before he/she see it as a thing of enjoyment" [Married female adult with no formal education, Ibadan southeast FGD, aged 30 years, R6]

An unmarried female adolescent emphasised that some people engaged in oral or anal sex to test what they have learnt about these sexual behaviours:

> "some people may want to practice oral or anal sex because they have heard of it, so they will want to have it with their partner, so as times goes on, they will start doing it" [Unmarried female with formal education, Ibadan southwest FGD, 18 years, R8].

Some participants suggested that peer influence was one of the major drivers for their previous experiences of oral or anal sex. A married man explained that he was stimulated to learn about oral and anal sex out of shared curiosity.

> "The number one reason why people are engaging in oral or anal sex is because of what they have seen or learnt about it. Even you may have dreamt it (…..). Even if your friend tells you that this was the style of sex I had with the lady I met yesterday, you will have it in mind that anytime that I want to have sex with a lady, I must use this style too" [Married male adult with formal education, Ibadan southeast FGD, aged 33 years, R8].

A sex worker also explained how she was motivated to try penile-anal sex by watching a porn movie and subsequent encouragement by her boyfriend to try new sexual styles.

> "when my guy and I wanted to have sex, we watched blue film (porn movie). He can say, can you do this style? We sometimes engaged in betting to practice sexual style we have watched on blue film including anal sex" [Female sex worker, Ibadan southeast IDI, aged 23 years]

3.3.6.6. Other Motivations for oral and anal sex

Other reasons for engaging in oral or anal sex that were highlighted by the participants included: under the influence an excessive consumption of alcohol, illegal substance abuse, during sexual assault, and as a form of punishment to women.

3.3.7. Concerns associated with oral and anal sexual practices

Participants expressed different opinions regarding their concerns about oral and anal sexual behaviours. These concerns were based on hearsay, personal and general feelings, and from previous experiences. Participants with no previous experience spoke about hearsay and personal feelings to present their thoughts. Most of these participants presented their views as disadvantages of oral and anal sex compared to vaginal sex or as reasons why they have not engaged in oral or anal sexual acts. Another set of participants described their concerns from their previous experiences of oral or anal sex. The emerging themes from different discussions and interviews across the general population groups and FSWs were broadly categorized as follows: health risk concerns, stigmatization, religious teachings concerns, and personal displeasure concerns. Health risk concerns was further categorized into two sub-themes: risk of infection and disease, and physical injury and pain.

3.3.7.1 Health Risk Concerns

3.3.7.1.1 Infection and disease

The most feared risk by participants was acquisition or transmission of infections during oral or anal sex. Most participants believed that both oral and anal sex were risky and gave different examples to support their views. The anal cavity was considered an unclean place and a reservoir for different infections. They expressed concerns that condomless penile-anal sex would expose both partners to different infections. There was also a concern about recurrent urethral infections in men who engaged in condomless anal sex.

For example, a married woman described condomless anal sex to be unsafe and that it could cause serious urethral infections to men:

> "anal sex is not safe because there might be remnant of feaces and the man will now go in through the anus and you know the penis is open outside. By the time the penis enters anus, faecal materials could block the penile opening and the urethral pipe. This could result in a disease affecting prostate gland. It could also cause urinary

> infections. The person will not be able to urinate frequently, and they might be bleeding from urethral opening. If catheter is passed into the penis, bloody urine may come out. This is not any enjoyment. The enjoyment of one day could be a cause of death" [Married female adult with formal education, Ibadan southeast FGD, aged 44 years, R3].

The risk of sexually transmitted infections such as human immunodeficiency virus and human papillomavirus was highlighted as a possible risk from penile-anal sex. According to a female adolescent participant,

> "the disadvantage is that, for a man that has anal sex with different women, he can contract the disease, AIDS. He could contract HIV from there, he could contract HPV that you are talking about……" [Unmarried female young adult with formal education, Ibadan southwest aged 25 years, R2].

A sex worker stated that men could contract a urethral infection while women might be prone to the risk of cross-infection from the anal cavity into the vagina. She explained that penile thrusting during anal sex could cause urethral and vaginal infections. She counselled that men should always wash their penile shaft with water and use antibiotics with their partner after anal sex to prevent infection.

> "you know that waste product comes out from our bum-bum (anus). I'm very sure that if you insert your finger, it must come out with faeces. If a penis now enters the anus while thrusting, it could have contacted so many diseases inside. If care is not taking the person will come back and fuck you (vagina sex) again with that same penis. You will have problem because the disease is already in his body and he will transmit it to you. When my guy and I had anal sex, he removed the penis immediately and that ended the sex session. We later went to take our shower and took drugs". [Female sex worker, Ibadan southeast IDI, aged 27 years]

Oral sex was also perceived to be risky. Generally, women were thought to be at high risk of infection from licking an 'unhygienic penis', inadvertent swallowing of seminal fluids that could be a vehicle for pathogens, and the possible trauma to their mouth. Men could acquire infection from trauma to their mouth or penile shaft during oral sex.

For example, a female adolescent gave examples of different types of infections that could be acquired during oral sex as HIV and HPV. She said risk could occur when a woman/girl is giving oral sex to a man/boy.

> " the disadvantage is that, for a woman who sucks a man's penis and the sperm enters her mouth, she doesn't know if the man already has any disease.. if the man has any

disease like HIV, or HPV so the woman will contact disease from there" [Unmarried female with no formal education Ibadan southeast FGD R2, aged 21 years].

A woman mentioned that oral sex could also cause other problems, apart from the risk of HIV infection:

> "There are many diseases you can contract through oral sex. For example, if someone suck in sperm and allow it to enter your stomach and blood, you can contract HIV infection, cough related diseases or body swelling and egress of water from other parts her body" [Married female adult with no formal education, Ibadan southeast IDI, aged 40 years]

Some participants associated oral sex with the risk of mouth odour and mouth cancer. For example, a sex worker highlighted the possible risk of mouth cancer from giving oral sex.

> "We have been taught on different diseases that come up as a result of kissing the pussy (vagina) or "kinikan-kinikan" (something like that). Example of such is cancer. We in our circle make jest of customers that come for "wash-wash"/ clean-up (oral sex) to ridicule them". [Female. Sex worker, Ibadan southwest FGD, aged 21 years, R8]

There were concerns by some participants that people could contract an unknown or strange disease that may be difficult to treat as a result of frequent oral sex. A FSW said that the fear of contracting a disease would discourage her from considering financial benefit from oral sex:

> "I don't like oral sex because you wouldn't know the kind of disease the man is having in his penis and you are sucking for the purpose of money. At the end, you are attacked with disease that the money collected may not be able to treat. So, who is losing?". [Female sex worker, Ibadan southwest IDI, aged 35 years]

However, some participants in the general population believed oral sex to be safe. They rationalized that oral sex is not a known risk factor for acquiring HIV infection, unlike condoms bursting during vaginal sex or the use of contaminated sharp objects such as needles. A participant described her perception as follows:

> "Sucking doesn't allow one to contact HIV. Condoms too burst at times and if the person is HIV positive, you wouldn't know now especially because of drugs they use now. So, avoiding bad condoms, sharp objects and a host of others prevent us from contacting HIV. There are no other ways of contracting again". [Married female adult with no formal education, Ibadan southeast FGD, 45years, aged R4]

3.3.7.1.2. Physical injury and pain

Participants associated different injuries with anal and oral sex. Receptive anal sex by women was associated with faecal incontinence. Most FSWs expressed fear of having faecal incontinence with associated embarrassment, shame and a large financial cost to manage the condition.

> "If you have sex with a lady with infection, you might contact the disease. For the anal sex, it will get to a point that the anus will start leaking as if it's menstruation thereby leaving the anus wide open while it secretes water…. Those are the disadvantages". [Female sex worker, Ibadan southeast FGD, aged 29 years, R5]

Another sex worker recounted the counselling she received from her doctor to dissuade her from practicing anal sex. According to her narration, the doctor told her that penile thrusting during anal sex could damage her anal sphincter.

> "I could remember that a friend of mine who was indulging in anal sex usually gets wet whenever she sat down. Then, my doctor used to tell me that our anus contains a "small ball" (sphincter) and that when the small ball bursts, the person gets wet whenever she sits down". [Female sex worker, Ibadan southwest FGD, aged 33 years, R4]

The fear that there might be no competent expert to manage faecal incontinence in Nigeria further reinforced the concern of participants against anal sexual practice. A sex worker explained:

> "that means you want to kill me! White men have treatment for anal sex and Nigeria does not have that. I don't want to have a leaking buttock and I'm not ready for the use of diaper for the rest of my life". [Female sex worker, Ibadan southwest IDI, aged 32 years]

The risk of penile shaft injury during penile-anal sex was also highlighted. They explained that penile shaft injury could occur during penetration of anal canal. For example, a married man explained further:

> "Another thing a man uses his penis to penetrate the anus of a woman; his penis is bound to sustain wounds. You cannot compare the wideness of anus to vagina. The vagina will expand; the anus will not expand like the vagina. It is not so elastic compared to vagina. When you have a very big rod (penis), you will have wound. You will disturb yourself and you will disturb the person too. All these cause injury [Married male adult with formal education, Ibadan southeast aged 40 years, R7]

Most participants, particularly female participants and FSWs described anal sex pain as "excruciating". Some participants compared the pain experienced during anal sex with

childbirth pain, while others said the pain was just unbearable. A young adult woman while narrating her previous anal sex experience said she had to discontinue dating her boyfriend because of unbearable pain from his frequent request of penile-anal sex. She took her decision to quit the relationship despite threats by her boyfriend.

> "… I have to back out of the relationship because if he wanted to kill me. It happens that he loves to have sex with me through the anus, and the day he tried it, it was very painful. Therefore, I told him that I will not be able to do this again, that was the reason why I back out. He told me that do I want him to start going to other ladies? Although I was not ready to lose him, but I tried it with him again, but the pain I experienced was just too much to bear. I have to tell him that I won't be able to do such with him again" [Unmarried female young adult with no formal education, Ibadan southwest FGD, aged 21 years, R6]

A FSW narrated the painful distress she experienced during her first penile-anal sex.

> "Anal is very painful. I have tried it once. When I wanted to do it then, I screamed, and faeces came out through my anus. In short, that is why I said I don't like it, it's painful. It is very painful, and I can't do it". [Female sex worker, Ibadan southeast IDI, aged 23 years]

Participants highlighted injuries that are associated with oral sex. The FSWs ascribed the risk of injury during oral sex to the rough attitude of male clients. They observed that some of their clients, in an attempt to fully enjoy their money, would insert their penile shaft deep into women's throats, which would sometimes choke them and could have some other health risks.

> "I think so, because if you suck some guys there are some little sperm that will be entering your mouth. Some guys like inserting their 'dick' (penis) inside your mouth so that you won't be able to talk. Assuming you are holding and sucking penis, you will be able to spit sperm out. Some guys will insert penis strongly that their sperms go directly inside of your throat. I think there is a risk because you wouldn't know what the person is bringing from his house to the brothel. If he wants to fuck (have sex with) you, you will give him condom. The sperm will be inside the condom and it will not have any contact with you, but if you are sucking him, the sperm will be coming out little by little into your mouth". [Female sex worker, Ibadan southeast IDI, aged 27 years]

According to some participants, malalignment of teeth of the person giving oral sex could cause injury to the person receiving oral sex. For example, a married man said that a man could be injured on his penile shaft if the woman giving oral sex has a misaligned set of teeth.

> "For oral sex, one may be unfortunate to meet a lady with a set of teeth that is misarranged and when she tampers with that penis it can definitely cause injury". [Married male adult with formal education, Ibadan southeast FGD, aged 33 years, R8]

3.3.7.2. Stigmatization concern

Stigmatisation from friends, relatives and community members to people that practiced oral or anal sex was another major issue of concern. Both the general population participants and FSWs believed that oral and anal sexual practices are not acceptable in the community. They felt that the negative reaction in the community might be due to the perception that oral and anal sex are alien in their culture. Some adolescent participants explained further that anyone caught engaging in anal sex could suffer abuse and different forms of discrimination. For example, a female adolescent said that some people could be isolated and hated for their action.

> "If there are people like that are engaging in such things like oral or anal sex that people may develop hatred for them because it's not really normal; people may develop hatred for them, they might want to abstain from them and might not want to have anything to do with this person so that's it" [Unmarried female adolescent with formal education, Ibadan southwest FGD, aged 18 years, R10].

A young adult female said that people practicing oral or anal sex could suffer from guilty feelings and personal frustration due to fear of reprimand from the community members.

> "if such a thing happened the person that engaged in this kind of act (oral or anal sex), and she knows that some people were aware of what she was doing, so when she passed by without people abusing her, even from her heart she will feel guilty in her that she is a prostitute and start blaming herself that why was she into such act? that she shouldn't have done this kind of a thing with the guy" [Unmarried female young adult with no formal education, Ibadan southwest FGD, aged 23 years, R4].

The same fear of stigmatisation could also occur among sex workers in the brothel. A participant explained that it would be a difficult task for anyone to openly admit that they practiced oral or anal sex in the brothel. She added that this might be the reason why some sex workers would bluntly deny practising oral and anal sex in public.

> "they will not accept oral or anal sex in public. I don't do it and some people will say it is not good. what is the rationale in getting involved in oral or anal sex? It is very common here to suck penis or suck vagina…. nobody will come outside here and say, she just had oral or anal sex now. They don't accept things like that because of stigmatization. …. there is no way you can discuss such (oral and anal sex) with a family member. A family or friend cannot yield to that kind of sexual practice. Even, if one practices it indoor; you will deny it outside that God forbids that I suck a man or a woman". [Female sex worker, Ibadan southwest FGD, aged 33 years, R4]

There were discussions by some participants that the fear of previous verbal abuse or public ridicule by people encouraged the culture of silence about discussing oral or anal sexual behaviours. However, a few participants said they would not mind discussing their sexual behaviours including oral and anal sex. A FSW during an IDI said that she could confidently discuss her oral and anal sex experience with trusted confidants to avoid risk of public disgrace:

> "I shared my experience with my best friend and not everybody. You see, in this our job, it is good to always have someone that you can confide in. The reason is that if you discuss your matter with everyone, they will use that medium to insult you here. Some may be indulging in oral and anal sex, but they will not come to the public to say that. Therefore, I only know of myself, I don't know of others". [Female sex worker, Ibadan southwest IDI, aged 32 years]

3.3.7.3. Religious teachings concerns

The religious interpretation of oral and anal sex and associated concerns was another broad thematic issue that was discussed mostly among the general population participants. Participants discussed the perspectives of the three major religions in Nigeria on the two sexual behaviours and the implications on their personal life. The three major religions (Christianity, Islam and Traditional) were said to be against oral and anal sexual practices. Some participants described anal sexual practices as "satanic" and ungodly. These negative interpretations make open discussion on any of these two sexual practices very sensitive, if not impossible, in the midst of the followers of these religions. For example, a man was emphatic that all the three religions considered oral and anal sex to be unacceptable behaviours.

> "Without deceiving ourselves among the three religions oral and anal sex practices are not acceptable in our country" [Married male adult with no formal education, Ibadan southeast FGD, aged 45 years, R6]

Another man, during the same FGD, explained further that the three religions condemned these sexual acts and the followers of these faiths would not want to associate with anyone that engaged in oral or anal sex:

> "All the three religions in Nigeria, they all consider people who engaged in such acts as devilish people because if you look at it too, it is not acceptable. So, the three religious bodies will totally condemn the act too; they dislike people who engage in such acts" [Married male with no formal education Ibadan southeast FGD, aged 45 years, R3].

In one of the discussion sessions, a female young adult said that the mere mentioning of oral and anal sex could be irritating to the people that are very religious.

> "some that are religious, if they hear such thing (oral or anal sex), it always sounds so irritating to them..." [Unmarried female young adult with no formal education, Ibadan southwest FGD, aged 22 years, R5]

3.3.7.4. Personal displeasure concerns

Some participants expressed their personal displeasure about oral and anal sexual practices. The personal displeasure was described as 'disgusting' or 'irritating' or 'to make them vomit' and 'not enjoyable'. Most of the participants that raised this as a major concern were male and female adults and female adolescents/young adults during the discussions and interviews. An adult summarised his personal view on oral and anal sex as follows:

> "there is no enjoyment in both anal and oral sex, it is irritating to me because it is very bad, and God is against" [Married male adult with no formal education, Ibadan southeast FGD, aged 45 years, R8].

A female young adult participant suggested that the risk of the inadvertent swallowing of seminal fluid could be irritating to a woman.

> "I want to mention that oral sex has a lot of disadvantages because by the time the man wants to ejaculate there is no way the lady would not feel irritated and this could provoke vomiting" [Unmarried female young adult with no formal education, Ibadan southwest FGD, aged 21 years, R6]

Another woman also said that she could not engage in oral or anal sex with her husband under any reason because these sexual acts were disgusting to her. A few FSWs also amplified the personal displeasure discourse on oral and anal sex. A sex worker, while expressing her displeasure, said that she could not be lured with money to allow oral or anal sex by her clients.

> "as for me, I don't indulge in oral sex because it irritates me and I'm always afraid of contracting disease. I have been so guided by this thought to the extent that I don't practice it with my boyfriend. Also, I'm always of the view that I don't know the destination of the sperm in case I swallowed it in my body. I don't know how white people do theirs, whether they swallow sperm or not. If you attempt offering me 10,000 naira (28USD), I will not do it at all because it irritates me" [Female sex worker, Ibadan southwest FGD, aged 32 years, R8]

3.4. DISCUSSION

This is the first formative qualitative study that explores the perspectives of adolescents and adults among the general population and brothel-based FSWs regarding oral and anal sexual behaviours in West Africa. The study provided a mixed pattern of perspectives on the knowledge and perceptions, interpretations, and attitude towards oral and anal sexual behaviours in the community. Although the study participants had heard of oral and anal sexual behaviours, adolescents/young adults and FSWs demonstrated better knowledge about these practices compared with older adults from the general population. There was better knowledge about oral sex than about anal sex, particularly, on the description of different slang words or local names. The participants, especially the adolescents/young adults and FSWs, were a bit more comfortable discussing oral sex than anal sex. The sources of information on both sexual behaviours were similar; most participants learnt these behaviours from watching sexually explicit movies including pornography and from their sexual partners. There was a general perception by participants that the use of slang words to describe oral and anal sex may be misleading, especially when it is used to frame research questions for an interview. However, the views on the acceptability of using slang terms in the community to describe sexual behaviours differed across population groups; only adolescents/young adults and FSWs would readily accept slang/colloquial terminologies for oral and anal sexual behaviours. Although the emerging themes regarding the motivations for and the health risk concerns of practicing oral and anal sex were similar, there were subtle differences in these themes between participants from the general population and the FSWs.

In this study, adolescents/young adults and FSWs engaged in more robust discussions on the meaning of oral and anal sex than adults from the general population. This might reflect the changing sexual behaviours that are being reported among the young people and the key affected populations. The increasing liberal access to sexually explicit movies on different platforms could have possibly provided a higher exposure to these behaviours in young people than the adults [363-365]. It is not surprising that the most frequently mentioned source of information of oral and anal sex in this study was watching pornographic movies. In spite of the knowledge of oral and anal sex by many participants, some of them gave incorrect definitions for these sexual behaviours. For example, oral sex was defined by some

participants as an exchange of erotic messages between lovers or condomless penile-vaginal sex. Similarly, anal sex was referred to by some as penile-vaginal sex from behind. The misconceptions about the definitions and the lack of knowledge of oral and anal sexual behaviours by some participants suggest that researchers may need to consider this while designing their studies to avoid eliciting incorrect responses. Asking direct question about oral and anal sex might not convey the intended meaning to the participants unless these terminologies are clearly defined.

The significance of using a clear definition of oral and anal sex for framing research questions was unanimous among the participants despite the observed differences on the acceptability of using slang words to describe both sexual behaviours. The danger of incorrect interpretation of questions and the fear of negative reactions from the people when oral or anal sex slang terms or colloquial terminologies are used were emphasized during the discussions and interviews. Some of these slang terms were considered vulgar and unacceptable in the community. Findings from similar studies from some Southern African countries also highlighted the risk of poor comprehension and misinterpretation of research questions that are framed with local terminologies or slang [304, 358]. According to the VOICE D study, a qualitative study that highlighted the challenges associated with socio-cultural differences in the translation of penile-vaginal sex among 88 women from South Africa, Uganda and Zimbabwe [358], use of local terms or slang words alone could change the meaning of the questions that the researcher intended to ask. Other issues that were emphasized in the VOICE D study to improve the quality of research instruments for data collection on sexual behaviours and better comprehension of questions included translation and back translation of questions, use of culturally acceptable terms for definition and the use of visual aids such as diagrams/sketches, particularly for people with low literacy levels [358].

Although the use of oral and anal sex slang terms may not be useful to conduct research, slang word is a sub-culture phenomenon which borders on identity as evidenced in this study[358]. People who use slang words have something in common and they understand such language within their clique[366]. This may be the reason why the adolescents/young adults and FSWs

would readily accept slang words as a means of communication and openly discuss their experience of oral and anal sex at ease. Some sex workers shared their experience on how they profiled customers to negotiate the price of sex. Customers that communicated and understood the slang terms for different sexual behaviours, including oral and anal sex, were usually charged less than those that were naïve to such methods of communication.

The discourse on the motivations for practicing oral and anal sex by people were similar to previous qualitative studies conducted among adolescent and adult women in Tanzania, USA and Canada [304, 367-369]. The four major motivating factors that emerged from our study were protection of sexual relationships, financial benefits, to improve sexual pleasure, and adventure. Gender and age groups of participants in the community determined how they talked about each of the four themes on the motivation for oral and anal sex. The discourse on the protection of sexual relationships as a motivator for engaging in oral and anal sex came out loudly among the unmarried adolescents/young adults and FSWs. Apart from the risk of losing sexual partners to other individuals, the need to protect sexual relationships by women might be a reflection of the submissive role that they are expected to play in a patriarchal society and financial dependency [370].

The FSWs gave a deeper insight into the role of financial inducement to encourage people to accept oral and anal sex than women in the general population. They explained the huge financial price that is often placed on oral and anal sex by customers to incentivised them to allow oral and anal sex before vaginal sex, even when they despise it. A qualitative study in South Africa also showed that FSWs will negotiate for high price from clients to allow condomless sex or oral or anal sex[371]. In Ethiopia, FSWs (18-39 years) reported that they engaged in anal sex with fees paying clients when need money for personal needs, out of coercion from clients, particularly when they are both drunk and to practice it for the fun of it[372]. Men/boys emphasised the need to improve sexual pleasure and adventure as the possible motivators for engaging oral and anal sex. This finding is consistent with the results of a qualitative study among long-distance drivers in the Morogoro region of Tanzania that found where most truck drivers mentioned better sexual pleasure with anal sex than vaginal sex as their main motivational reason [324]. In same study, the women would practice anal sex provided the male partner is willing to pay money [324]. Oral sex was perceived as an

effective foreplay act that hastened orgasm while penile-anal sex was believed to offer enhanced sexual pleasure at penetration.

The fear of acquiring infections and other diseases, physical injury, stigmatization, and breaching the religious teachings, as well as personal disapproval were the key concerns raised against oral and anal sexual practice. Although the opinions of most participants did not differ on these perceived risks, the adolescents/young adults and sex workers spoke more than the adults about the risk of infection and stigmatization. Participants associated a risk of acquiring sexually transmitted infections such as HIV and human papillomavirus with both oral and anal sex. Oral sex was also reported to be associated with the risk of cancer. The fear of stigma and the breaching of religious teachings might be responsible for the culture of silence around oral and anal sexual practice. Even in the brothels where discussions about sexual practices appeared to be more acceptable than in the community, some sex workers sometimes denied practicing oral and anal sex when an unfamiliar person requested it or asked about it.

The strength of this qualitative study includes the enrolment of different population groups that that had different sexual relationships and experiences within the community. The triangulation of the focus group discussions and in-depth interview data make the research findings robust on these emerging sexual behaviours. The study also provided the opportunity to seek the input of people in the community in the preparatory stages of the survey design. The study participants made recommendations as to how the questions about oral and anal sex should be framed to enhance acceptability and clarity.

There are a number of potential study limitations. There is a risk of social desirability bias due to the sensitive nature of oral and anal sex in the community. It was difficult to fully discern the impact of negative reactions from people on their reported perceptions of oral and anal sex during the discussions and interviews. The fear of negative reactions, including the risk of stigma, may have resulted in some participants limiting the depth of information that they wanted to share. The study did not include other population groups such as men that have sex with men, lesbians, bisexuals, long-distance drivers, people working at bars or

entertainment venues, and street-based sexual workers who may have different perspectives about oral and anal sex. The study did not capture boys and girls aged10 to 17 years in the community, this omission makes it difficult to understand the full range of perspectives of adolescents on different sexual behaviours. There could also be a risk of contamination from information collected from participants that were recruited for both FGD and IDI. For example, it is plausible that some participants might have used some information from their interaction and experience with other participants during FGDs to respond to questions during the IDIs.

3.5 CONCLUSION

This formative study provides insights on different aspects of oral and anal sex among adolescents and adults in the general and key affected populations. The focus of this study covered critical aspects of oral and anal sexual behaviours that need to be understood in any given community, particularly, when related scientific research is being contemplated. Although oral and anal sex were known as specific sexual behaviours, they were still considered sensitive topics by the participants. The use of clear and culturally acceptable definitions of oral and anal sex instead of slang or colloquial terms was advised whenever the research questions are to be designed to improve the quality of responses and cooperation of people in the community. The perceived motivation for and against the practice of oral and anal sex were similar to findings in a number of previous studies.

This formative research provides a useful guide on how oral and anal sex questions were framed during the SHINI cross-sectional study that are presented in Chapters 5 and 6. For example, slang terms of oral and anal sex were not used in the design of questions for the cross-sectional study questionnaire. Information on attitudes of the people in the community towards both behaviours helped during the training of the interviewers for SHINI survey. Briefly, the research assistants were trained to stick by the clear definition of oral and anal sex in the case report forms, avoid judgmental attitudes during the interviews, and respect the views or responses of participants on each question. Furthermore, questions on oral and anal sex were asked towards the end of the interview when interviewers would have possibly secured the confidence of the participants. It is recommended that policy makers and other

stakeholders should initiate interventions to prevent or minimise risk associated with sexual risk behaviours that were expressed by participants. The intervention could be in form of health education/mass mobilisation, and introduction of sexual and reproductive health programme such as barrier contraception for prevention and treatment of any health-related challenges including STIs. Introduction of programmes that promote gender equity and rights, particularly, among adolescents and young people in the society will help to minimise gender imbalance on sexual and reproductive health and all forms of violence against women.

CHAPTER 4: EPIDEMIOLOGY OF ORO-GENITAL AND ANAL HUMAN PAPILLOMAVIRUS INFECTIONS AMONG SEXUALLY ACTIVE WOMEN IN IBADAN, NIGERIA

4.1. BACKGROUND

Oro-genital and anal cancers associated with HPV are increasingly reported among women in the general population, particularly, in developed countries [129, 373, 374]. The increased burden has been associated with changing sexual behaviours including oral and anal sex that make them vulnerable to HPV and other STIs [141, 375, 376]. It is evident from studies included in the systematic review presented in Chapter 2, that women in SSA frequently engaged in oral and anal sex with inconsistent use of protective barrier methods [157].

The natural history of HPV infections as a causative agent of cervical cancer is well documented worldwide [377]. The persistence of HR-HPV infections is a necessary cause of HPV-associated cancers [29, 378]. A similar epidemiology of HPV infections has been reported in other genital and anal cancers [379, 380]. Nigeria has one of the highest burdens of cervical cancer in SSA and presently accounts for half of the total new cases per annum in the sub-region of West Africa [7]. The most common of the 13 HR-HPV genotypes associated with cervical cancer in Nigeria are HPV -16, -18 and -35 [162, 163, 381-383]. In the last 20 years, the prevalence of cervical HPV infections ranged from 3.5% to 37.0% among the healthy population in the community, depending on the age, study population and associated co-morbidities such as HIV infection [384-387]. There are no published studies on the prevalence of oral, vulvar and anal HPV infections among girls and women in Nigeria.

In Nigeria, two studies have specifically reported on the prevalence of oral and anal sex among women in the general population [271, 335]. One study reported that 5.3% of 131 adolescent girls in schools had ever given oral sex [335]. Another study among 725 adult women in the community reported that only 3.0% had ever given and 4.6% ever received oral sex [271]. In this same study, 0.7% reported receiving anal sex from their partners [271]. However, none of these published studies explored any association between oral and anal sexual behaviours and the risk of HPV infection. The qualitative study in Chapter 3, oral and anal sexual

behaviours were reported by girls and women in the community in Ibadan, Nigeria. A number of participants believed these behaviours could be a risk factor for acquiring HPV infection. However, it is uncertain how these sexual behaviours are associated with the risk of HPV infection acquisition and transmission in both young and adult women in the community.

Characterising the different sexual behaviours, including oral and anal sex, are important in order to fully understand the epidemiology of oro-genital and anal HPV infections in Nigeria. To address this gap in research, this study presents the results of the household survey on the prevalence of and risk factors associated with oral, cervical, vulvar and anal HPV infections among girls and women in the general population in Ibadan, Nigeria. In addition, an analysis of the prevalence of oral and anal sex among girls and women are also presented.

4.2. METHODS

4.2.1. Study design

This was a cross-sectional, epidemiological study conducted among women from the general population that involves a household community survey and collection of biological samples. The survey was a two-stage design. The first stage involves selection of EAs from the study sites by probability proportional to size and the second stage was simple random selection of study participants from the sampling frame.

The cross-sectional study was part of the SHINI study. The study investigates different sexual practices such as vaginal, oral and anal sexual behaviours, non-penetrative sexual practices, circumcision and intravaginal or penile cleansing. This analysis employed the data collected from females in the general population in Ibadan.

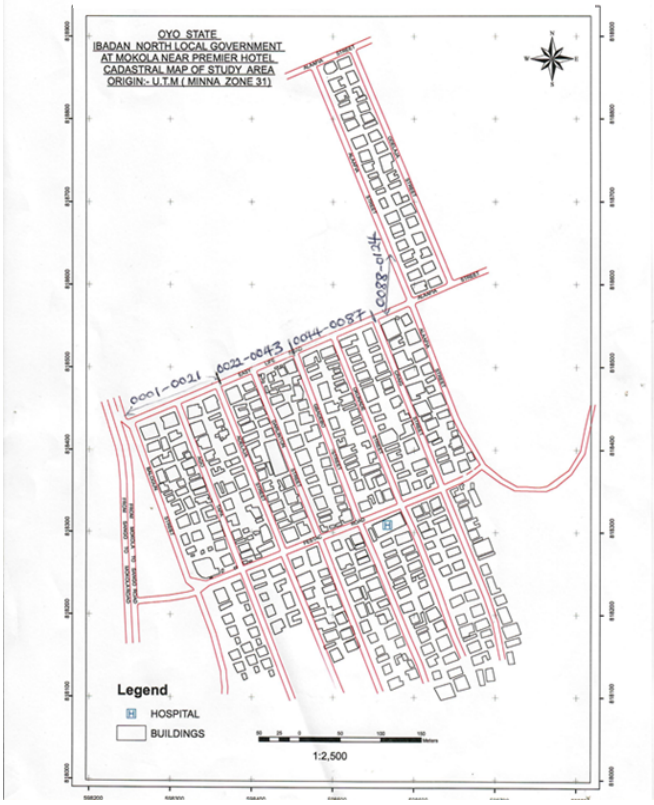
4.2.2. Study setting

The study was conducted in Moniya [population: 53,000] and Sasa [population: 25,000]. Both are contiguous peri-urban communities in the Akinyele local government authority (LGA) and Mokola [population: 77,000], a high-density urban community in Ibadan North LGA. These study settings were selected because they are heterogenous in culture, religion and socio-economic/demographic profiles to determine the prevalence of HPV infections in these

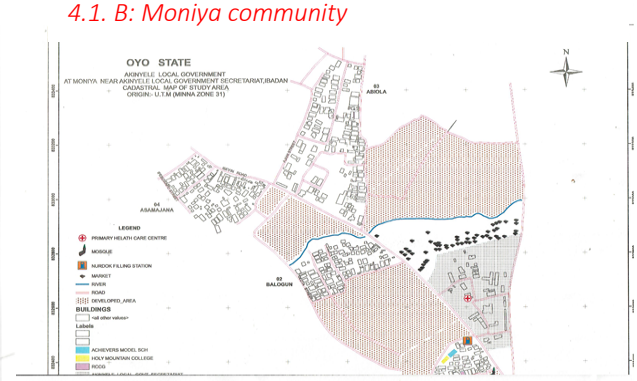
diverse populations. Each community is comprised of smaller enumeration areas (EA). The 2006 National Census EA maps for each of the selected study sites (Mokola, Moniya and Sasa) were updated during boundary delineation. The staff of the Nigerian Population Commission and office of the Surveyor General in Oyo State offered technical support to produce updated cadastral maps for each of the study sites (***Figure 4.1: Cadastral maps of study sites at Mokola, Moniya and Sasa***).

Figure 4.1: Cadastral maps of the SHINI study sites at Ibadan North and Akinyele LGAs

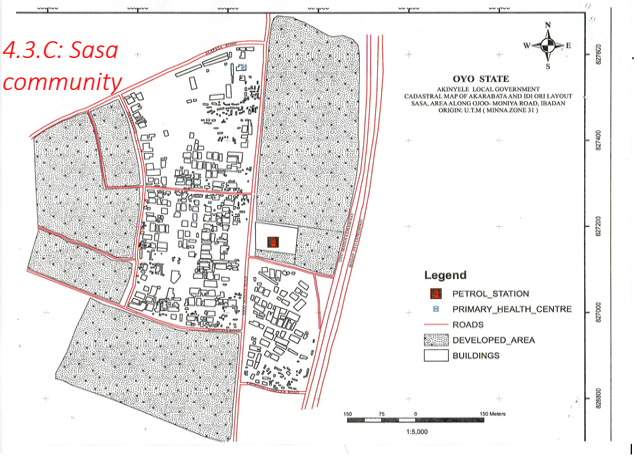
4.1. A: Mokola community



4.1. B: Moniya community



4.3.C: Sasa community



4.2.3. Study population

The eligible participants were sexually active female adolescents and adults aged 18-45 years residing in Mokola and Moniya/Sasa communities. The study excluded young adolescents (<18 years), pregnant women, nursing mothers, people who were not resident at the study sites and those that declined participating in the study including biological sample collection.

4.2.4. Sample size determination and power

The primary outcome of this study is the prevalence of oral, genital (cervix and vulva) and anal HPV infections. Previous studies of HPV prevalence in Nigeria reported a genital HPV infection prevalence of 10-50% in the female population [163, 381]. Data on oral and anal HPV prevalence from Nigeria are lacking. Prevalence estimates of oral HPV from a systematic review of studies elsewhere was 3 – 6% in relation to oral HPV [388].

The precision of estimating the prevalence of HPV infection in the community will depend on the overall sample size and design effect. The design effect measures the effect of the multistage sampling design on the precision and this depends on the intra-cluster correlation coefficient (ICC). The ICC is likely to vary for different HPVs (genotypes and anatomical sites) and in the absence of preliminary data one cannot give a reliable estimate of the ICC and hence the design effect. Table 4.1 illustrates the precision with which the prevalence of HPV infection among the female population aged 18-45 years in the community can be measured for a range of prevalences and a range of design effects with a sample size of 300.

Table 4.1: Table for sample size calculation

HPV Prevalence (%)	N	**Design Effects**			
		1.5	**2**	**2.5**	**3.0**
3.0	**300**	**2.4**	**2.7**	**3.1**	**3.3**
5.0	300	3.0	3.5	3.9	4.3
10.0	300	4.2	4.8	5.4	5.9
20.0	**300**	**5.5**	**6.4**	**7.2**	**7.8**
35.0	300	6.6	7.6	8.5	9.3
50.0	**300**	**6.9**	**8.0**	**8.9**	**9.8**

Precision with which prevalence of HPV can be estimated with a sample size of 300 for different assumptions concerning HPV prevalence and the design effect of the survey

Assuming an alpha of 0.05 and a design effect of 2 owing to the clustered sampling design, a sample size of 300 would be able to estimate a prevalence of 3% with a precision of ± 2.7%. A prevalence of 20 % could be estimated with a precision of ± 6.4% and that of 50% with a precision of ± 8.0%. This sample size will also be able to detect differences between groups. For example, if the true prevalence of HPV infection in those aged 18-25 is two times the prevalence in those aged 26-45 years, then it would give 80% power to detect the difference

provided that the prevalence in older participants is at least 12% (Table 4.2). This sample size will also be able to explore the association of risk factors regarding HPV infection. For example, assuming HPV prevalence is 20%, there will be at least 80% power to estimate an odds ratio of 2.5 or more, if the prevalence of the risk factor among those that are negative is at least 20%.

Table 4.2: Table for power calculation[1]

Prevalence of HPV in group 1	Sample size in each group	Prevalence of HPV in group 2	Power		
			Design effect		
			1.5	2	2.5
5%	150	15%	67%	54%	46%
5%	150	20%	91%	81%	72%
10%	150	30%	95%	89%	81%
10%	150	40%	>99%	99%	98%
5%	300	15%	92%	83%	74%
5%	300	20%	>99%	98%	95%
10%	300	30%	>99%	99%	98%
10%	300	40%	>99%	>99%	>99%
5%	150	15%	67%	54%	46%

1- Power to detect the difference between two groups as regards the prevalence of HPV for different assumptions of prevalence in each group, sample size and design effect

4.2.5. Study procedures

The summary of study procedures is presented in Figure 4.2.

Training of field staff and community entry

After the recruitment of field staff, two-weeks training was conducted for the field (interviewers, data entry clerks and nurses) and laboratory staff members on good clinical practice, principles of research ethics and the research protocol, including the data collection tools. Another one-week training on the syndromic management of STIs and HIV counselling and testing was conducted for the research nurses. After the training, the research team visited the study site communities for advocacy meetings. Specifically, the research team met and discussed the objectives of the SHINI study with the administrative leadership of the local

government authority, health medical officers, social mobilisation committee members, traditional/religious leaders and landlord association officials in each LGA.

Sampling of study participants

A multi-stage sampling technique was used to select eligible participants at each study site. The first stage sampling involved random selection of four EAs each at Mokola and Moniya, and one EA at Sasa by probability proportional to size using the 2006 National Population Commission Census lists of the EAs [389]. Each individual house was assigned a unique identification number. Subsequently, the research assistants visited each house to list all adolescents and adults aged 18-45 years. The house listing data from each of the study sites were stratified into two age groups, female adolescents and adults (**FAA** - 18-25 years) and female adults (**FAD** - 26-45 years), to serve as a sampling frame for the study. The second stage sampling involved systematic random sampling of eligible participants from each sampling frame till the desired sample size of 310 was achieved.

Participant enrolments

The enrolment of randomly selected eligible participants occurred at home. The research assistants explained the objectives of the study to the potential participants. This explanation was buttressed by giving an information leaflet written in English or the local language (Yoruba). Interested potential participants were then given clinic appointments. Follow-up reminder phone calls were made at 72 hours and 24 hours prior to the clinic appointment, whilst a short message service was also sent to potential participants on the morning of their clinic appointment. Participants that declined an invitation during a home visit or were not met at home after two visits in a week were excluded from the study.

Clinic visit, interview, sample collections and follow-up

After confirming that a potential participant met the inclusion criteria, a written informed consent or witnessed consent was obtained at the clinic following a repeat explanation of study procedures, including collection of biological samples.

Face-to-face interview

The interview was conducted by a female research assistant in a private room at the clinic. The interview covered information on socio-demographics, sexual behaviours (vaginal, oral

and anal sex) and hygiene practices, intravaginal practices, alcohol, smoking/stimulant use in addition to history and current symptoms of STI/HIV *(**Annex 4.3: Female Case Report Form**)*. Information on the history of HPV vaccination was not collected from the participants because the vaccine has not been introduced as part of routine immunisation and it is not universally available in Nigeria. However, information on the awareness of HPV vaccination was collected. The operational definitions of vaginal, oral and anal sex and other non-penetrative sexual behaviours were presented in the case report form in order to provide a clear understanding of the content of the questions that were asked. The research nurse always took the medical history aspect of the interview after the research assistant had concluded her own interview. The interview was conducted in English or in Yoruba for participants that could not speak English.

Rapid HIV counselling and Testing

After a face-to-face interview, a female nurse obtained consent for HIV counselling and testing with "opt-out" for individual participants if they did not wish to know their HIV status. A 5 ml venous blood was drawn into a sample bottle for serial rapid diagnostic HIV tests (RDT). The RDT involves testing of sample blood with Alere Determine™ HIV-1/2 (Alere Medical Co. Ltd, Matsudo-shi, Chiba-ken, Japan). Participants found to be positive in relation to the Determine RDT kit had a further HIV test with Uni-Gold™ HIV-1/2 (Trinity Biotech Manufacturing Ltd; Ireland) RDT. Discordant results between Determine and Uni-Gold RDT were further tested with HIV 1/2 Stat-pak® (Chembio Diagnostic System, Inc. Medford, New York, USA) as a "tie-breaker" test to determine the final result. This HIV testing protocol was based on the National Guidelines for HIV Prevention Treatment and Care, Federal Ministry of Health, Nigeria[173]. Participants that did not wish to know their HIV test result had an anonymous RDT. They were not given their results (***Annex 4.2: RDT HIV serial testing***).

Clinical examination and sample collection

Two female research nurses at each clinic conducted clinical examinations and collected biological samples from specified anatomic sites (cervix, vulva, anal and oral). Overall, two samples each were collected from the oralcavity and the cervix, vulvar and anus of each female participant. A set of four samples collected was shipped to ICO, Spain for HPV DNA analysis, while the other set of four samples was stored in a freezer as a back-up in Nigeria. If

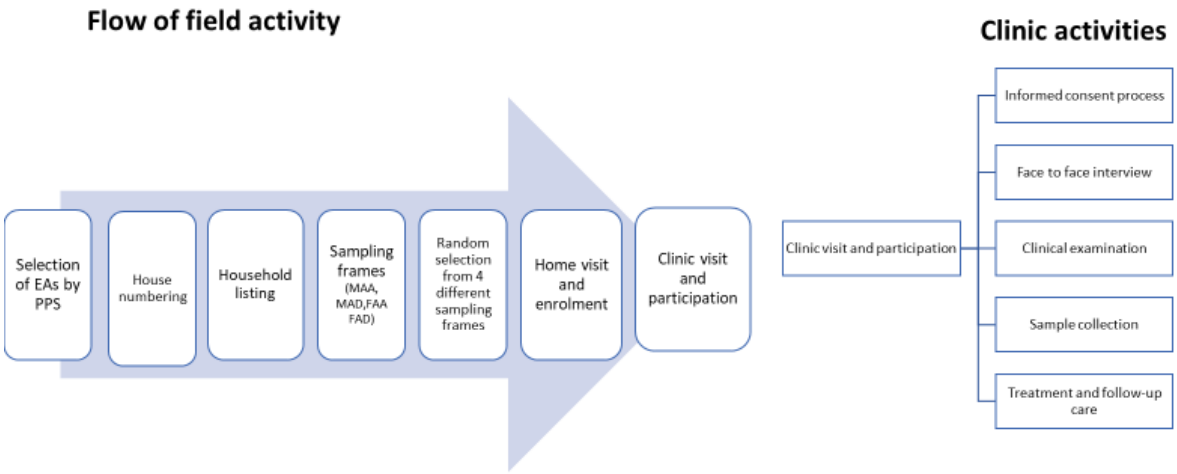
a woman was menstruating, another appointment was given if she declined sample collection.

Prior to collecting each sample, the nurse conducted a clinical examination by inspection. Then, an oral sample was collected using a 30 second oral rinse and gargle method with 10mls of Scope mouth wash (Procter & Gamble©). A nurse demonstrated the rinse and gargle procedure for individual participant to watch. The participant sample was collected into a 10 ml labelled sample bottle and placed immediately into a cold box filled with ice-packs. To collect the vulvar sample, the labia were exposed with the participant in a dorsal position with legs apart. The tip of a Dacron swab was used to rub the introitus on either side of the vaginal orifice without touching the urethral orifice. The cervical sample was then collected by inserting a sterile Cusco speculum into the vagina to expose the cervix. The tip of a new Dacron swab was inserted into the cervical os and gently rotated 360 degrees to avoid trauma to the cervix and potential bleeding before removing it. An anal sample was collected with the participant in a left lateral position. A Dacron swab was inserted into the anal canal (about 5-6 cm beyond the anal verge) and rotated 360 degrees with gentle pressure around the anal verge before removing it. Each of the samples collected with swabs were placed in separate 2 ml cryotubes that were labelled and barcoded prior to being placed into a cold box filled with ice-pack. Samples stored in the cold box filled with ice-packs were transported every four hours to the SHINI study laboratory at the University College Hospital, Ibadan and immediately stored in a -80^{0}C freezer.

Follow-up care and visit at the clinic

Participants with symptoms and signs of STIs were offered free syndromic management and counselled for partner notification and treatment [390]. The HIV rapid test result was given to participants at the clinic and the research nurse offered individual post-test counselling irrespective of the outcome of the test result. Participants with positive rapid HIV test results were referred and linked to a free service specialist clinic for further counselling, repeat test and treatment based on the Nigerian National HIV Protocol [391]. Participants that had other medical complaints were referred to a hospital of their choice. Each participant was given health related incentives such as a bar of medicated soap, toothbrush and paste and also a soft drink and biscuit as refreshments and 1000 naira (3.0GBP) to cover transportation.

Figure 4.2: Summary of the study procedure in the community



4.2.6. Laboratory procedures

Sample transport and storage

All samples collected at the clinics were labelled with unique laboratory identification number barcodes to anonymise participants' information. Samples were transferred in cold boxes at 2-8^{o}C to the SHINI laboratory at the University College Hospital, Ibadan, for daily sorting and storage in a freezer at a temperature of -80^{o}C. After the fieldwork was completed, samples were shipped on dry-ice to the ICO, Barcelona, Spain. The back-up samples were stored at a temperature of -80^{o}C in the freezer of the PI (IMB) in Nigeria.

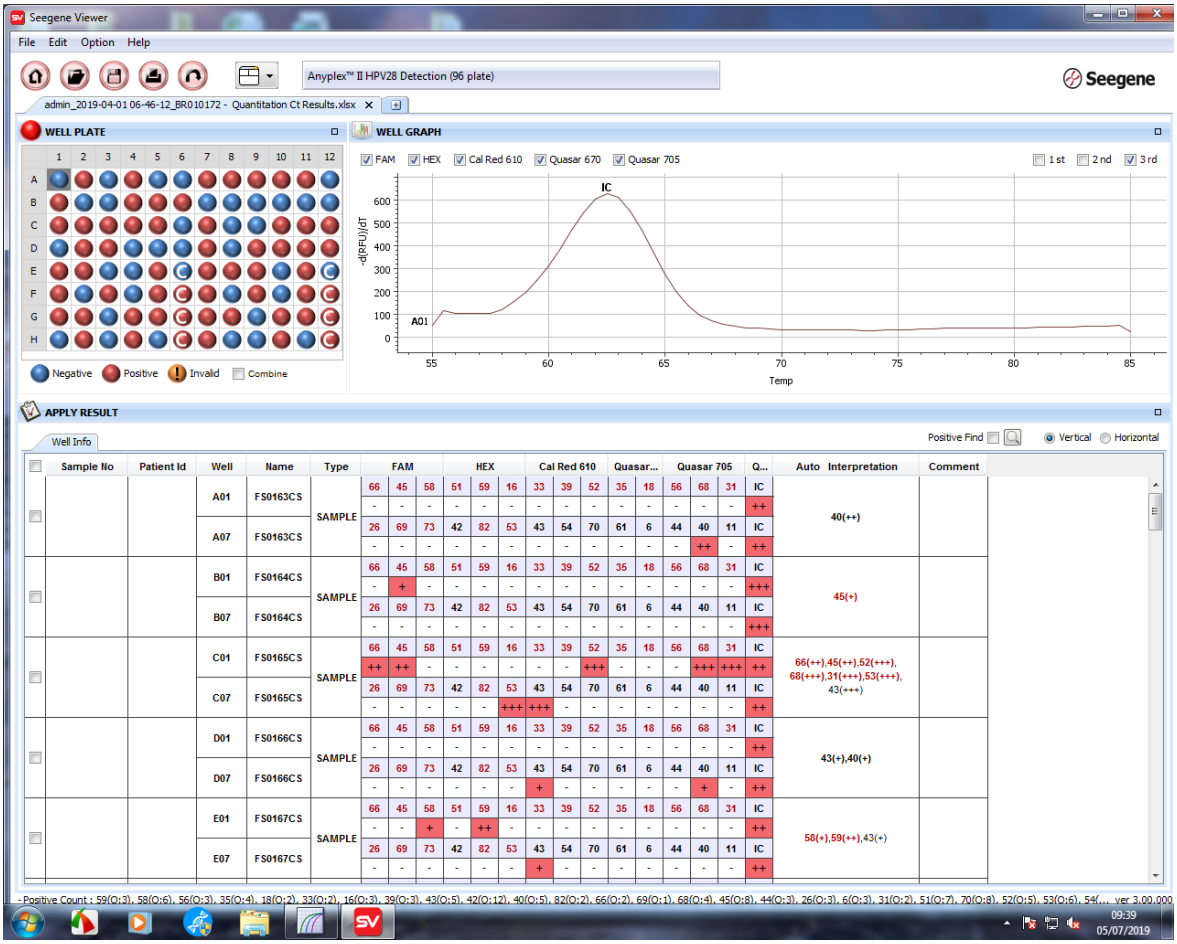
HPV DNA Sample analysis

HPV genotyping of all samples was performed at the ICO, Spain that has extensive experience in HPV molecular diagnostics. HPV genotyping was completed using the Anyplex™ II HPV28 (Seegene, Seoul, South Korea) assay; a validated PCR-based quantitative technique for the detection and genotyping of 28 HPV types [392]. Anyplex™ II HPV28 detection test distinguishes 28 HPV genotypes, including HR-HPV (HPV -16, -18, -31, -33, -35, -39, -45, -51, -52, -56, -58, -59 and -68), LR-HPV (HPV -6, -11, -40, -42, -43, -44, -53, -54 and -70) and possibly carcinogenic genotypes (HPV-26, -61, -66, -69, -73 and -82).

DNA was extracted from the cervical, vulvar and anal swabs using the Maxwell 16 Buccal swab LEV DNA Purification kit, while DNA extraction from the mouthwash specimen was performed using the Maxwell® 16 LEV Blood DNA (United Kingdom) Kit as recommended by the manufacturer of Promega. The **A set** is a multiplex assay that permits simultaneous amplification of target DNA of 14 HR-HPV genotypes (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66 and 68), while the **B set** is a multiplex assay that permits the simultaneous amplification of target DNA of 5 high-risk (26, 53, 69, 73 and 82) and 9 low-risk (6, 11, 40, 42, 43, 44, 54, 61 and 70) HPV types [393]. The process is conducted in two reactions by taking advantage of the five dyes that can be resolved on the CFX96™ real-time PCR instrument (Bio-Rad, Marnes-la-Coquette, France) [392]. The Anyplex™ II HPV28 detection test was performed as recommended by the manufacturer with 5µl of DNA in each of the two reaction mixtures (20 µl) with the A and B primers.

Data recording and interpretation were automated with Seegene viewer software (Seegene, Seoul, South Korea), according to the manufacturer's instructions (Figure 4.3). Viral load was semi-quantified in Anyplex based on specific catcher melting points: the viral titre is low (**+**) if there is a positive signal after 40 PCR cycles; medium (**++**) when a positive signal is between 31 and 39 PCR cycles and high (**+++**) when there is a positive signal before 31 PCR cycles (Figure 4.3). The inclusion of internal control allows the entire process from DNA extraction to PCR amplification to be checked. Beta (β)-globin is used as the internal control to demonstrate the presence of human DNA in each sample. If the internal control was negative, but the test result was positive, the test result was considered valid. A sample that had a poor or no signal for β-globin was defined as an invalid sample.

Figure 4.3: Interpretation of HPV results on automated Seegene viewer software



4.2.7. Data management

Data from the field were received daily at the SHINI research office for quality checks and stored in a locked metal cabinet. The case report forms data were double entered into REDCap software (*Vanderbilt University, Nashville Tennessee, USA*)[394-396] that was hosted on the website of the College of Medicine, University of Ibadan, by two trained data entry clerks. The data manager resolved any inconsistences observed in the data set. Thereafter, the raw data were exported in CSV format and saved. Exported data were imported into STATA 16.0 (*Stata 2019. Statistical Software: Release 16. College Station, TX: StataCorp LLC*) software for analysis. Visual checks of the data were undertaken by IMB and the data manager. Frequencies of all variables were generated to check for any error, missingness or incorrect responses. The missing variables were reported in the descriptive analyses but were

dropped in the test of associations and multivariable models. Data cleaning was performed by IMB.

4.2.8. Statistical Analyses

Participants' selected descriptive variables were summarised using frequencies and proportions for the categorical variables and mean and standard deviations for the continuous variable – age (Tables 4.1, 4.2 and 4.3).

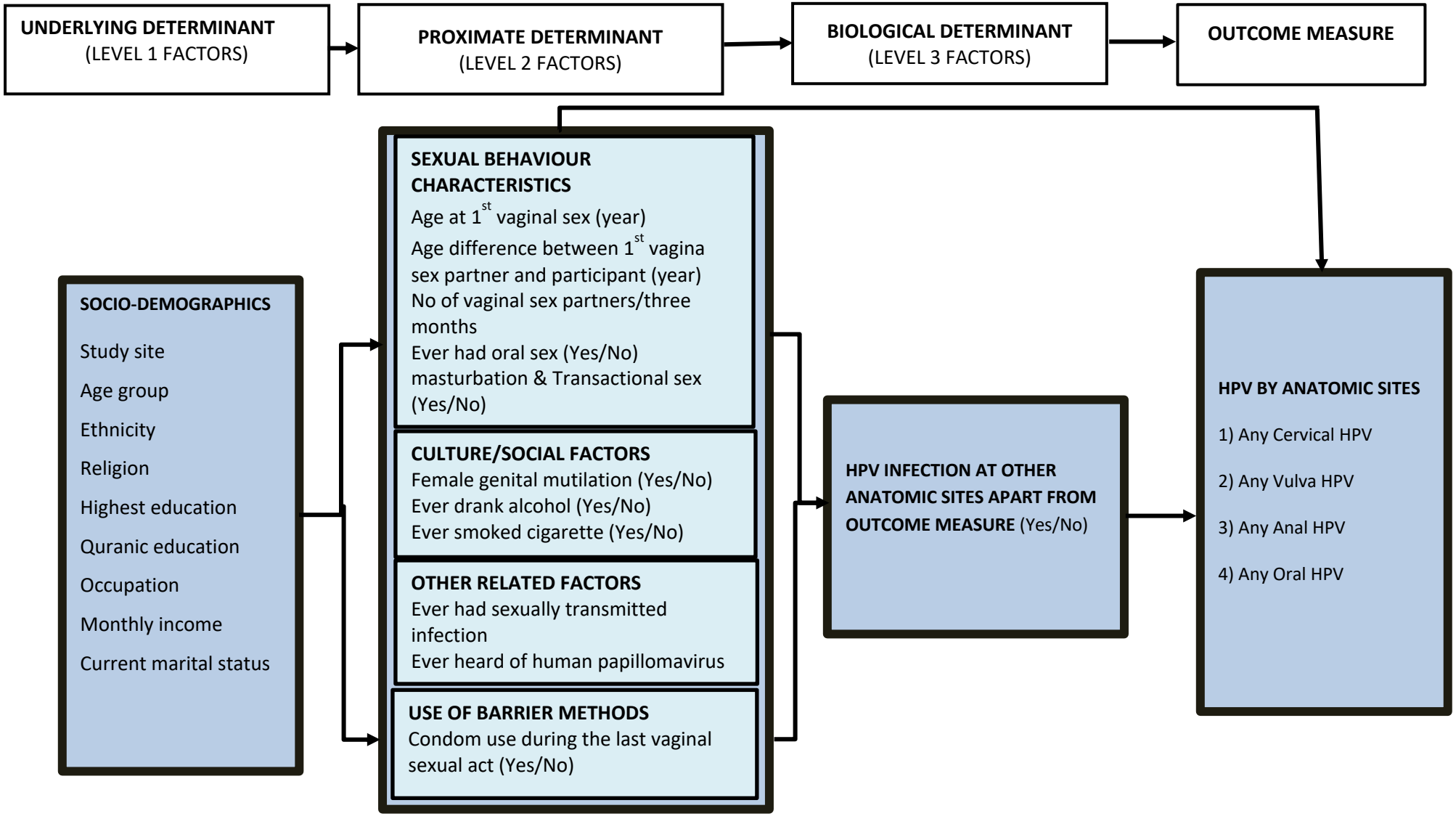
4.2.8.1. Outcome variables

The primary outcome of this study was the prevalence of any HPV infection. The prevalences of HR-HPV and LR-HPV infection and according to the 2009 IARC epidemiological oncogenic classification (Groups 1, 2a, 2b and 3) for each of the anatomical sites were calculated with their 95% confidence intervals. The trend of association between each classification of HPV and the age group of participants was calculated with ANOVA. The secondary outcomes were the prevalence of different sexual behaviours (oral and anal). However, the risk factor analysis was limited to oral sex alone for the reason that only one participant reported anal sex in the two study sites.

4.2.8.2. Risk factor analysis for any HPV Infections

A conceptual framework for the risk factor analysis of any HPV infection among women in the general population was developed after a review of the literature to answer the specific objectives in this study (Figure 4.4).

Figure 4.4: Conceptual Framework for the risk factor analysis of any HPV infection among females in the two communities in Ibadan, Nigeria



Associations with any HPV infection were explored to determine independent risk factors for infection the detection of any HPV infection was treated as a binary outcome; each anatomical site – oral, cervical, vulvar and anal - was analysed separately. Logistic regression was applied to obtain crude estimates for the association between any HPV infection and potential risk factors (Table 4.7, 4.8, 4.9 and 4.10). Adjusted estimates were obtained using a hierarchical modelling technique [397]. Age group and study sites were included in the adjusted estimates *a priori*. Level 1 (Figure 4.4) sociodemographic variables included ethnicity, religion, highest educational level, ever had Qur'anic education, current occupation, monthly income and current marital status. Each variable was added one by one to a model that included age and study site. P-values were obtained by likelihood ratio tests. Any variable that met a p value ≤ 0.10 was included in the adjusted model. All level 1 variables were adjusted.

Level 2 (Figure 4.4) behavioural variables included age at first vaginal sex, age difference between first vaginal sex partner and the participant, lifetime number of vaginal sex partners, ever cleansed vagina, condom use during last vaginal sex, ever had oral sex (given or received), history of transactional sex, ever had mutual masturbation, history of female genital mutilation, alcohol use, illicit drug use, ever had sexually transmitted infection and ever heard of human papillomavirus. Each level 2 variable was added one by one to a model that included level 1 variables that met a p-value cut off of ≤ 0.1 after adjusting the 'core variables'. Any level 2 variable that met a p value cut off of ≤ 0.1 was included with the level 1 core variables in the level 2 adjusted model. Level 3 (Figure 4.4.) biological variables were laboratory detection of concurrent HPV infection from the other three anatomical sites apart from the outcome measure. For example, if the outcome measure was to determine risk factor for any cervical HPV, concomitant detection in vulvar, anal and oral sites were included as explanatory variables.

Each level 3 variable was added one by one to a model that included level 1 'core variables' and level 2 factors that met a p value cut off of ≤ 0.1. Any level 3 variable that met a p-value cut off of ≤ 0.1 was included with the level 1 and level 2 'core variables' in the level 3 adjusted model. This strategy allowed the effects of variables at each level of the framework to be

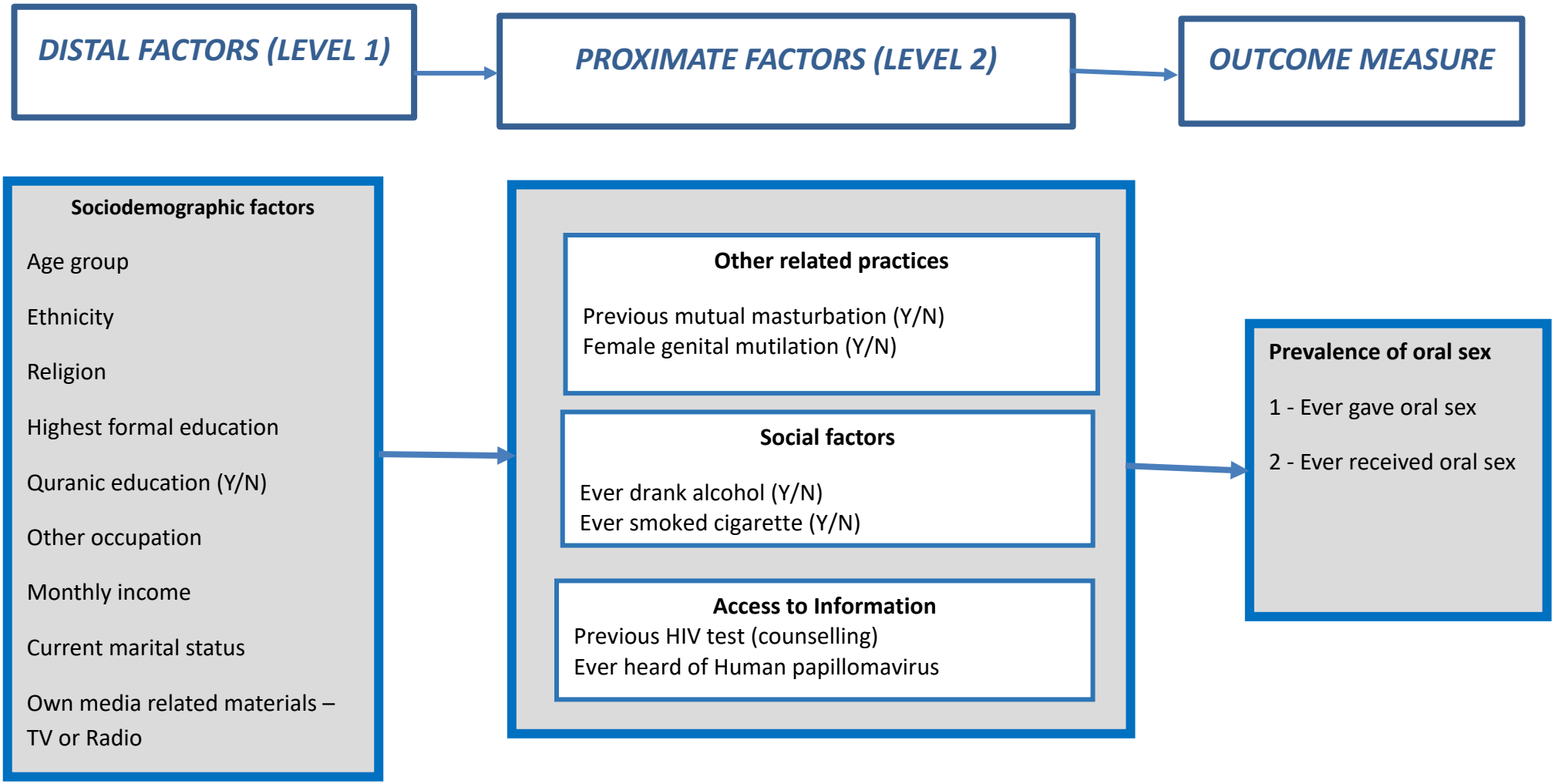
assessed, adjusted for more distal variables. The following variables were excluded in the model because of small number of observations: history of transactional sex, ever smoked cigarette and rapid HIV test results.

The concordance of HPV between anatomic sites (oral, cervical, vulvar and anal samples) in individual study participants was defined as the presence of the same type of virus across the four sites. The proportion of concordance for specific HPV type was calculated as the number of each HPV type in all the four sites, any of three and any of two anatomical sites. In addition, the concordance of specific HPV genotype was calculated for each of the anatomical sites and the concordance between anogenital sites only, cervix and vulva only, cervix and anal sites only, cervix and oral sites only, vulva and anal sites only, oral and anal sites, as well as oral and vulva sites only.

4.2.8.3. Risk factor analysis of oral sexual behaviour

The conceptual framework in Figure 4.5 was developed to investigate the association of selected individual and behavioural factors as potential risk factors of oral sex among the females in the community.

Figure 4.5. Conceptual Framework for the risk factor analysis of oral sex among females in two communities in Ibadan



As there were few women in the general population who reported oral sex, a binary outcome for any oral sex that combined giving and receiving oral sex was used as the outcome variable. Logistic regression was used to obtain crude estimates for the association between any oral sex and potential risk factors (Table 4.13). Adjusted estimates were obtained using a hierarchical approach. Age and study sites were included in the adjusted estimates *a priori* (Figure 4.5). Level 1 sociodemographic variables included ethnicity, religion, highest educational level, current occupation, ever had Qur'anic education, monthly income, owned a television and radio, as well as current marital status. Each variable was added one by one to a model that included age and study site. P-values were obtained by likelihood ratio tests. Any variable that met a p-value cut off of ≤ 0.10 was included in the adjusted model. All level 1 variables were adjusted and shown in Table 4.13. Level 2 behavioural variables included: ever had other sexual partners, history of transactional sex, ever had mutual masturbation, history of female genital mutilation, alcohol use, illicit drug use, awareness of human papillomavirus and previous HIV screening. Each level 2 variable was added one by one to a model that included level 1 variables meeting a p value cut off of ≤ 0.10 after adjusting the 'core variables'. Any level 2 variable that met a p value cut off of ≤ 0.10 was included along with the Level 1 core variables in the Level 2 adjusted model. All level 2 variables were adjusted and exhibited in Table 4.12.

4.2.9. Ethical considerations

Ethical approvals were obtained from the Ethics Committee of the London School of Hygiene and Tropical Medicine, the University of Ibadan/University College Hospital Ethical Committee and the Oyo State Ethical Review Board (***Annex 3.5: Ethical approvals***). During enrolment, each participant was verbally informed about the study and given a copy of the information leaflet (***Annex 4.2: Information leaflet)*** that provided a detailed description of the research. At the clinic, a female research assistant obtained written informed consent from individual potential participants after a detailed explanation of the study objectives and participation in the study. The consent covered understanding the research objective, participation including samples collection and HIV counselling and testing, storage of samples for future studies, as well as dissemination of the results. The consent involved permission to transport biological samples from Nigeria to ICO Spain for laboratory analysis. Additionally, witnessed consent was obtained for participants that were not literate. The research assistant

explained the study in the presence of a literate third party chosen by the prospective participant. After the participant agreed to participate, the witness signed and dated the consent form. Participants that could not write placed a witnessed thumb print over the signature section of the consent form.

The major part of the cross-sectional study on females focused on sexual behaviours and the collection of samples to measure HPV prevalence. The confidentiality of participant's data was maintained to a high standard throughout the study. The enrolment register that contained personal identifier data (name, address and sex) was locked in a cabinet inside the principal investigator's office (IMB) to prevent unauthorised access. The samples were collected by trained female research nurses at a private room in the clinic. Each participant had a unique code (identification number) comprising four numeric digits in each of the case reports and laboratory samples forms, besides the reports and administrative reports/forms to maintain confidentiality. The log files that contained an individual participant's name and address without their identification number were stored in a separate locked cabinet away from the case report forms. Electronic data were password protected with access restricted to specific key staff members including the PI and data managers. Due to the sensitive nature of the study, research assistants were trained to maintain absolute confidentiality to minimise the risk of participants being stigmatised.

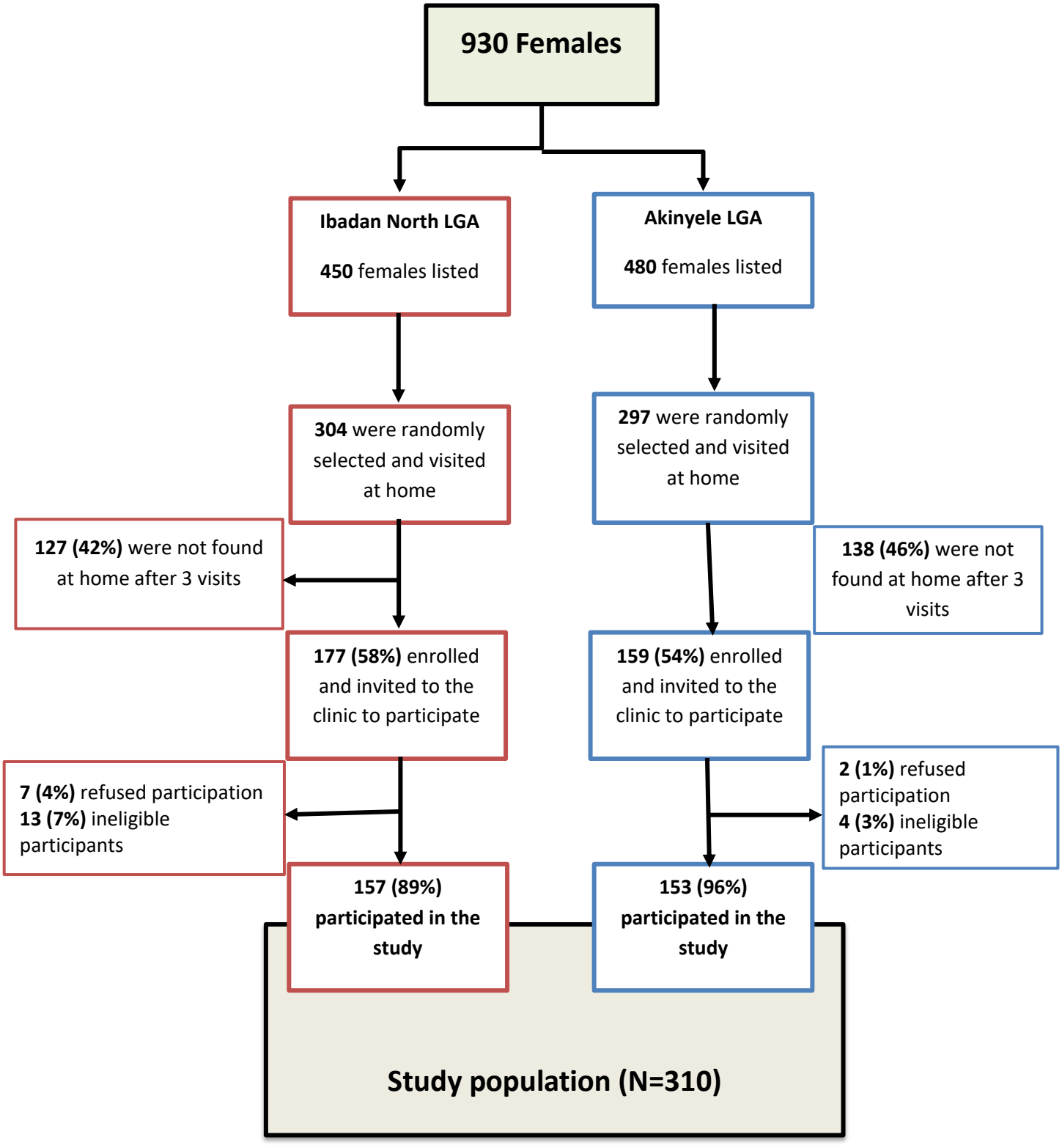
4.3. RESULTS

4.3.1. Descriptive results of study participants in the two communities

A total of 930 potentially eligible females from selected households in two communities in Mokola, Ibadan North and Moniya/Sasa, Akinyele (480) LGAs were listed. The summary of the participant enrolment at the two study sites is shown in Figure 4.6. Out of the 450 potentially eligible females listed in Mokola, 304 participants were randomly selected and visited at home. Of those visited, 127 were not found at home after three home visits. Of the 177 (58%) participants found at home in Mokola and invited into the clinic, 157 (89%) consented to participate in the study, 13 (7%) were not eligible, and seven (4%) declined participation. In Moniya/Sasa, 480 potentially eligible females were listed, of which 297 were randomly selected. Of those visited, 138 females were not found at home after three visits. Of the 159

(54%) participants found at home in Moniya/Sasa and invited to the clinic, 153 (96%) consented to participant in the study, four were ineligible (3%), and two (1%) females refused to

Figure 4.6: Female participant enrolment flow for the community survey



4.3.1.1. Socio-demographic characteristics

The mean age of the participants was 29 years (SD=7). Participants in Moniya/Sasa (29 ± 8 years) were slightly older than those in Mokola (28 ± 7 years) but this was not statistically significant. A third of participants were aged 18-24 years (Table 4.3). The distribution of some of the participants' socio-demographic variables was the same in the two communities except for age group, ethnicity, religion, current marital status and items personally owned by the participant. There were more women aged 25-34 years and below in Mokola than Moniya/Sasa population (p=0.040). The proportion of participants in Moniya/Sasa that were from the Yoruba ethnic group was more than those in Mokola (p<0.001). There were more Christians (58%) than Muslims (41%) among participants in Mokola and more Muslims (68%) than Christians (32%) among participants in Moniya/Sasa community (p<0.001). There were more participants in Moniya/Sasa that owned a mobile phone (92% versus 79%; p = 0.001), television (80% versus 25%; p<0.001), radio (64% versus 17%; p<0.001), generator (40% versus 10%; p<0.001) and a house (9% versus 1%; p = 0.001) compared with those living in Mokola.

Table 4.3: Socio-demographic characteristics of sexually active females in two communities in Ibadan, Nigeria

Variable	**Total N=310**	**Mokola N=157**	**Moniya/Sasa N=153**	**p-value**
	n (% column)	**n (%column)**	**n (% column)**	
Age, years				
Mean (SD)	29 (7)	28 (7)	29 (8)	0.481
Age group, years				
18-24	121 (39%)	61 (39%)	60 (39%)	
25-34	101 (33%)	60 (38%)	41 (27%)	0.040
35-45	67 (28%)	36 (23%)	52 (33%)	
Ethnicity				
Yoruba	240 (77%)	95 (61%)	145(95%)	
Hausa/Fulani	37 (12%)	33 (21%)	4 (2%)	
Igbo	19 (6%)	16 (10%)	3 (2%)	<0.001
Others ethnic minorities	13 (4%)	13 (8%)	1 (1%)	
Religion				
Christianity	140 (45%)	91 (58%)	49 (32%)	<0.001
Islam	168 (54%)	64 (41%)	104 (68%)	
Traditional	2 (1%)	2 (1%)	0 (0%)	
Highest education level				
No formal education	6 (2%)	2 (1%)	4 (3%)	
Primary	56 (18%)	26 (16%)	30 (20%)	0.403
Secondary	176 (57%)	87 (55%)	89 (58%)	
Tertiary	72 (23%)	42 (27%)	30 (20%)	

Quranic education				
No	197 (64%)	98 (62%)	99 (65%)	0.676
Yes	113 (36%)	59 (38%)	54 (35%)	
Occupation				
No current paid job (e.g. student, housewife)	54 (17%)	36 (23%)	18 (12%)	
Unskilled worker (e.g. office assistant, food vendor)	18 (6%)	9 (6%)	9 (6%)	0.066
Semi-skilled worker (e.g. driver, tailor)	218 (70%)	104 (66%)	114 (75%)	
Skilled worker (e.g. teacher, technician, doctor)	20 (7%)	8 (5%)	12 (8%)	
Income per month				
No income	35 (11%)	17 (11%)	18 (12%)	
1 - 10,000N (1-28USD)	126 (41%)	106 (67%)	105 (68%)	0.951
10,001 - 20,000N (>28 – 56USD)	85 (27%)	26 (17%)	24 (16%)	
> 20,000N (> 56USD)	64 (21%)	8 (5%)	6 (4%)	
Current marital status				
Single and Living alone	82 (27%)	59 (38%)	23 (15%)	
Married and living as married	212 (68%)	89 (57%)	123 (80%)	<0.001
Divorced/widowed/separated and living alone	16 (5%)	9 (6%)	7 (5%)	
Items personally owned by participant				
Mobile phone	265 (85%)	124 (79%)	141 (92%)	0.001
Television	161 (62%	39 (25%)	122 (80%)	<0.001
Radio	124 (40%)	26 (17%)	98 (64%)	<0.001
Generator	77 (25%)	16 (10%)	61 (40%)	<0.001
House	14 (5%)	1 (1%)	13 (9%)	0.001

4.3.1.2. Sexual relationships, partnerships and behaviours

The participants at both research sites were significantly different in the number of lifetime partners for vaginal sex, reported condom use during the last vaginal sex, history of ever giving or receiving oral sex, number of lifetime partners oral sex were given or received, history of mutual masturbation and self-masturbation, alcohol use, illicit drug use and clinical evidence of female genital mutilation (Table 4.4.). The majority of participants had only one lifetime vaginal sex partner (53%). There was a higher proportion of this group of women in Moniya/Sasa (59%) than Mokola (47%) (p = 0.001). There was a higher number of women in Mokola (29%) that had three or more lifetime vaginal sex partners than those in Moniya/Sasa (14%). Although condom use during last vaginal sex was low (18%), a higher proportion of women in Mokola (24%) reported condom use during their last vaginal sex than women in Moniya/Sasa (12%) (p = 0.004).

Thirty-five (11%) participants reported ever giving oral sex to a male partner. The majority were from Mokola compared to Moniya/Sasa (16% versus 7%) community (p = 0.009). Thirty-six women (12%) reported having ever received oral sex from a male partner, whilst there were more women that reported ever receiving oral sex from a male partner in Mokola

relative to Moniya/Sasa (17% versus 7%; p = 0.006). Of all the participants interviewed at both study sites, only one participant in Mokola reported ever having heterosexual anal sex (data not shown). There were higher proportion of participants in Mokola that had had mutual masturbation compared to those in Moniya/Sasa (87% versus 63%; p < 0.001). However, higher proportion of people in Moniya/Sasa reported a history of self-masturbation than those in Mokola (67% versus 46%; p < 0.001). There were higher proportion of women in Moniya/Sasa that reported using water to cleanse inside their vagina (98% versus 79%; p < 0.001) and had experienced female genital mutilation (61% versus 46%; p = 0.006) compared to women in Mokola. Participants from Mokola had higher proportions of those that ever drank alcohol (43% versus 11%; p<0.001) and engaged in illicit drug use (12% versus 2%; p = 0.001) compared to those living in Moniya/Sasa. The most common illicit drugs ever taken include tramadol in 18(82%), Shisha in 8(36%) and codeine in 3(14%) by participants in the two communities.

Table 4.4: Sexual relationships, partnerships and behaviours of sexually active females in two communities in Ibadan, Nigeria

Variable	Total N=310	Mokola N=157	Moniya/Sasa N=153	p-value
	n (% column)	n (% column)	n (% column)	
Currently in a sexual relationship				
Yes	298 (96%)	149 (95%)	149 (97%)	0.258
No	12 (4%)	8 (5%)	4 (3%)	
Age of current main sexual partner[1], years				0.156
Mean (SD)	36 (9)	35 (8)	37 (10)	
Age at first vaginal sex[2], years				
≤ 18	133 (44%)	73 (48%)	60 (39%)	
19-21	106 (35%)	47 (31%)	59 (39%)	0.324
22-24	39 (13%)	21 (14%)	18 (12%)	
≥ 25	26 (9%)	11 (7%)	15 (10%)	
Age of first vaginal sex partner[3], years				
Mean (SD) = 274	19 (3)	19 (3)	20 (3)	0.779
Number of lifetime partners for vaginal sex				
Single vaginal partner	163 (53%)	73 (47%)	90 (59%)	0.030
Multiple vaginal sex partners (≥ 2)	147 (47%)	84 (53%)	63 (41%)	
Condom use during last vaginal sex				
No	254 (82%)	119 (76%)	135 (88%)	0.004
Yes	56 (18%)	38(24%)	18 (12%)	
Ever gave oral sex to a male partner				
No	275 (89%)	132 (84%)	143 (93%)	0.009
Yes	35 (11%)	25 (16%)	10 (7%)	
Age when the first oral sex was given to a male partner, years				

≤ 24 ≥ 25	17 (52%) 16 (48%)	11 (46%) 13 (54%)	6 (67%) 3 (33%)	0.438[4]
Age of partner when the first oral sex was given[5], years Mean (SD) = 32	31 (6)	32 (7)	31 (5)	0.736
Number of lifetime partners given oral sex None Single vaginal partner Multiple vaginal sex partners (≥ 2)	275 (89%) 29 (9%) 6 (2%)	132 (84%) 20 (13%) 5 (3%)	143 (93%) 9 (6%) 1 (1%)	0.024[4]
Condom use by male partner when last oral sex was given No Yes	33 (94%) 2 (6%)	23 (92%) 2 (8%)	10 (100%) 0 (0%)	1.000[4]
Ever received oral sex from a male partner No Yes	274 (88%) 36 (12%)	131 (83%) 26 (17%)	143 (93%) 10 (7%)	0.006
Age when the first oral sex was received from a male partner[6], years ≤ 24 ≥ 25	21 (62%) 13 (38%)	13 (52%) 12 (48%)	8 (89%) 1 (11%)	0.107[4]
Age of partner when the first oral was received[7], years Mean (SD)	30 (6)	31 (6)	30 (8)	0.643
Number of lifetime partners you received oral sex from None Single vaginal partner Multiple vaginal sex partners (≥ 2)	274 (88%) 30 (10%) 6 (2%)	131 (83%) 20 (13%) 6 (4%)	143 (93%) 10 (7%) 0 (0%)	0.004[4]
Any barrier methods used during last time oral sex was received No Yes	34 (94%) 2 (6%)	24 (92%) 2 (8%)	10 (100%) 0 (0%)	1.000[4]
Ever had anal sex No Yes	309 (100%) 1 (0%)	156 (99%) 1 (1%)	153 (100%) 0 (0%)	1.000[4]
Ever had transactional sex No Yes	291 (94%) 19 (6%)	145 (92%) 12 (8%)	146 (95%) 7 (5%)	0.260
Condom use for last transactional sex No Yes	11 (58%) 8 (42%)	7 (58%) 5 (42%)	4 (57%) 3 (43%)	1.000[4]
Ever had mutual masturbation[8] No Yes	76 (25%) 234 (75%)	20 (13%) 137 (87%)	56 (37%) 97 (63%)	< 0.001
Ever had self-masturbation No Yes	135 (44%) 175 (56%)	84 (54%) 73 (46%)	51 (33%) 102 (67%)	< 0.001
Ever cleansed inside vagina[9] No Yes	36 (12%) 274 (88%)	33 (21%) 124 (79%)	3 (2%) 150 (98%)	< 0.001
Female genital mutilation[10]				0.006

No Yes	144 (46%) 166 (54%)	85 (54%) 72 (46%)	59 (39%) 94 (61%)	
Ever drank alcohol No Yes	 226 (73%) 84 (27%)	 90 (57%) 67 (43%)	 136 (89%) 17 (11%)	< 0.001
Ever smoked cigarettes No Yes	 307 (99%) 3 (1%)	 154 (98%) 3 (2%)	 153 (100%) 0 (0%)	0.248[4]
Ever taken any illicit drugs[11] No Yes	 288 (93%) 22 (7%)	 138 (88%) 19 (12%)	 150 (98%) 3 (2%)	0.001

***1**-27 missing; **2**- 6 missing; **3**-36 missing; **4**- Fisher's exact test; -2- missing; **6**-2 missing; **7**-2 missing; **8**- Mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No); **9**- Cleansing of vagina was defined as using water or another substance to clean inside vagina by inserting half or whole finger; **10**- Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No); **11**-Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria;*

4.3.1.3. Relevant medical history and clinical and laboratory diagnosis

Table 4.5 depicts information on relevant medical history, clinical and laboratory diagnosis in women in the Mokola and Moniya/Sasa. Only 23 (7%) women from both communities had ever heard of HPV. There was no significant difference between the two study sites. There were more participants with a previous history of STI (18% versus 10%; p = 0.041), clinical diagnosis of vaginal discharge (16% versus 9%; p = 0.046) and hypertension (8% versus 1%; p = 0.004) in Mokola compared to the community at Moniya/Sasa. All participants consented to rapid HIV diagnostic tests. Only 8(3%) of them were established to be HIV positive.

Table 4.5: Relevant medical history and clinical and laboratory diagnosis among sexually active females in two communities in Ibadan, Nigeria

Variable	**Total N=310** n (% column)	**Mokola N=157** n (% column)	**Moniya/Sasa N=153** n (% column)	**p-value**
Ever heard of HPV No Yes	 287 (93%) 23 (7%)	 149 (95%) 8 (5%)	 138 (90%) 15 (10%)	0.114
Sources of information on HPV Hospital or clinic Media (TV/Radio/Newspaper/Magazine) Internet Friends/peer Other Cannot remember	 8 (35%) 5 (22%) 4 (18%) 1 (4%) 4 (18%) 1 (4%)	 1 (13%) 1 (13%) 2 (25%) 0 (0%) 3 (38%) 1 (13%)	 7 (47%) 4 (27%) 2 (13%) 1 (7%) 1 (7%) 0 (0%)	0.114[1]
Ever had a STI No Yes	 267 (86%) 43 (14%)	 129 (82%) 28 (18%)	 138 (90%) 15 (10%)	0.041

Ever tested for HIV infection				
No	175 (56%)	88 (56%)	87(97%)	0.885
Yes	135 (44%)	69 (44%)	66 (43%)	
Clinical diagnosis made at the clinic				
Vaginal discharge syndrome	38 (12%)	25 (16%)	13 (9%)	0.046
Pelvic Inflammatory Disease	2 (1%)	0 (0%)	2 (1%)	0.243[1]
Genital ulcer disease	2 (1%)	2 (1%)	0 (0%)	0.498[1]
Genital warts	2 (1%)	2 (1%)	0 (0%)	0.498[1]
Cervical growth (suspicious of cancer)	2 (1%)	1 (1%)	1 (1%)	1.000[1]
Hypertension	15 (5%)	13 (8%)	2 (1%)	0.004
Glycosuria	3 (1%)	1 (1%)	2 (1%)	0.619[1]
Rapid diagnosis of HIV at the clinic				
Positive	8 (3%)	6 (4%)	2 (1%)	0.283[1]
Negative	302 (97%)	151 (96%)	151 (99%)	

1.– Fisher's exact test

4.3.2. Prevalence of cervical, vulvar, anal and oral HPV Infection

Three hundred and ten samples were collected from each of the anatomical sites - cervix, vulva, anal and oral cavity - of the participants at both research sites, making a total of 1,240 samples. Out of these samples, twenty-four (7.7%) oral samples, seven (2.2%) anal samples, five (1.6%) cervical samples and one (0.3%) sample from the vulva were declared invalid samples in the laboratory due to the low amount of β globin portion of the DNA. All invalid samples were treated as missing.

Overall, the prevalence of any detectable HPV infection among females in the general population was 68.0% (95 % CI, 62.4-73.1) in the vulvar samples, 59.7% (95% CI, 53.9-65.2) in the cervical samples, 56.8% (95 % CI, 51.0-62.4) in the anal samples and 16.1% (95% CI, 12.0-12.9) in the oral samples (Table 4.6). Generally, the prevalence of any HPV was highest in each of the anatomical sites among participants aged 18-24 years, with the prevalence decreasing with the increasing age group of the participants. There was a significant inverse relationship between the age group of the participants and any HPV, any class 1, class 2B, class 3, and LR-HPV, as well as multiple HPV infections (two or more different genotypes of HPV from a sample) in cervical samples. However, in the vulvar samples, a significant inverse relationship exists between the age group of participants and any class 1, any LR-HPV and multiple HPV infections. Similarly, there was also a significant inverse relationship between age group and the prevalence of any LR-HPV and multiple HPV infections in anal samples. Though, the observed prevalence of any oral HPV was highest among the youngest age group (18-24

years), this association was not statistically significant. Detection of any carcinogenic HPV genotypes (class 1), probable carcinogenic HPV genotypes (class 2A), possible carcinogenic HPV genotypes (class 2B) and unclassified HPV genotypes (class 3) was highest in the vulvar samples compared to the other three anatomical sites. For example, the overall prevalence of any carcinogenic HPV genotypes (class 1) was 48.2% (95% CI, 42.5-53.9) in the vulvar samples, 42.0% (95% CI, 36.4-47.7) in the cervical samples, 37.6% (95% CI, 32.1-43.3) in the anal samples and 10.1% (95% CI, 6.9-14.2) in the oral samples.

Similarly, the prevalence of any HR-HPV and LR-HPV genotypes was highest in the vulvar samples compared to the other three anatomical sites. For example, the proportion of any HR-HPV genotypes was 51.1% (95% CI, 45.4-56.8) in the vulvar samples, 44.3% (95% CI, 38.6-50.0) in the cervical samples, 39.3% (95% CI, 33.7-45.0) in the anal samples and 10.5% (95% CI, 7.2-14.6) in the oral samples. Detection of any LR-HPV types was 48.2% (95% CI, 42.5-53.9) in the vulvar samples, 40.3% in the cervical (95% CI, 34.8-46.1) and anal samples (95% CI, 34.7-46.0) and 9.4% (95% CI, 6.3-13.4) in the oral samples. The proportion of multiple HPV infection detection in the vulvar, anal cavity, cervix and in the oral cavity was 40.8% (95% CI, 35.2-46.5), 33.7% (95% CI, 28.4-39.3), 33.1% (95% CI, 27.9-38.7) and 4.5% (95% CI, 2.4-7.6), respectively (Table 4.6).

Table 4.6: Prevalence of Cervical, Vulvar, Anal and Oral Human papillomavirus infections among sexually active women from the general population in two communities in Ibadan, Nigeria (N=310)

Variable	Cervical Sample		Vulvar Sample		Anal Sample		Oral Sample	
	n/N[1]	Prevalence % [95% CI]	n/N	Prevalence (%) [95% CI]	n/N	Prevalence (%) [95% CI]	n/N	Prevalence (%) [95% CI]
Any HPV genotype		**p=0.014***		p=0.523		**p=0.021***		p=0.669
18-24 years	79/118	66.9 (57.8-75.3)	86/121	71.1 (62.1-79.0)	74/120	61.7 (52.4-70.4)	20/111	18.0 (11.4-26.4)
25-34 years	62/100	62.0 (51.7-71.5)	68/100	68.0 (57.9-77.0)	57/97	58.9 (48.3-68.7)	15/92	16.3 (9.4-25.5)
35-45 years	41/87	47.1 (36.3-58.1)	56/88	63.6 (52.7-73.6)	41/86	47.7 (36.8-58.7)	11/83	13.3 (6.8-22.5)
Overall	182/305	59.7 (53.9-65.2)	210/309	68.0 (62.4-73.1)	172/303	56.8 (51.0-62.4)	46/286	16.1 (12.0-20.9)
HPV classification by IARC[2]								
Class 1 – Carcinogenic[3]		p=0.074*		**p=0.026***		p=0.230*		p=0.967
18-24 years	58/118	49.2 (39.8-58.5)	65/121	53.7 (44.4-62.8)	50/120	41.7 (32.7-51.0)	11/111	9.9 (5.1-17.0)
25-34 years	41/100	41.0 (31.3-51.3)	48/100	48.0 (37.9-58.2)	38/97	39.2 (29.4-49.6)	9/92	9.9 (4.6-17.8)
35-45 years	29/87	33.3 (23.6-44.3)	36/88	40.9 (30.5-51.9)	26/86	30.2 (20.8-41.1)	9/83	10.8 (5.1-19.6)
Overall	128/305	42.0 (36.4-47.7)	149/309	48.2 (42.5-53.9)	114/303	37.6 (32.1-43.3)	29/286	10.1 (6.9-14.2)
Class 2A – Probable carcinogenic[4]		p=0.835[5]		p=0.954		p=0.094[b]		p=0.749[b]
18-24 years	5/118	4.2 (1.4-9.6)	9/121	7.4 (3.5-13.7)	8/120	6.7 (2.9-12.7)	1/111	0.9 (0.02-4.9)
25-34 years	4/100	4.0 (1.1-9.9)	8/100	8.0 (3.5-15.2)	1/97	1.0 (0.0-5.6)	0/92	0
35-45 years	5/87	5.7 (1.9-12.9)	6/88	6.8 (2.5-14.3)	5/86	5.8 (1.9-13.0)	1/83	1.2 (0.03-6.5)
Overall	14/305	4.6 (2.5-7.6)	23/309	7.4 (4.8-11.0)	14/303	4.6 (2.5-7.6)	2/286	0.7 (0.08-2.5)
Class 2B – Possible carcinogenic[6]		**p=0.006***		p=0.102		p=0.265		p=0.966
18-24 years	54/118	45.8 (36.6-55.2)	60/121	49.6 (40.4-58.8)	47/120	39.2 (30.4-48.5)	7/111	6.3 (2.6-12.6)
25-34 years	40/100	40.0 (30.3-50.3)	50/100	50.0 (39.8-60.2)	40/97	41.2 (31.3-51.7)	6/92	6.5 (2.4-13.7)
35-45 years	21/87	24.1 (15.6-34.5)	32/88	36.4 (26.4-47.3)	26/86	30.2 (20.8-41.1)	6/83	7.2 (2.7-15.1)
Overall	115/305	37.7 (32.2-43.4)	142/309	46.0 (40.3-51.7)	113/303	37.3 (31.8-43.0)	19/286	6.6 (4.0-10.2)
Class 3 – Unclassified[7]		**p=0.019***		p=0.154		p=0.597		p=0.835
18-24 years	14/118	11.9 (6.6-19.1)	16/121	13.2 (7.8-20.6)	12/120	10.0 (5.3-16.8)	4/111	3.6 (0.9-9.0)
25-34 years	5/100	5.0 (1.6-11.3)	8/100	8.0 (3.5-15.2)	6/97	6.2 (2.3-13.0)	2/92	2.2 (0.3-7.6)

35-45 years	2/87	2.3 (0.3-8.1)	5/88	5.7 (1.9-12.8)	7/86	8.1 (3.3-16.1)	3/83	3.6 (0.8-10.2)
Overall	21/305	6.9 (4.3-10.3)	29/309	9.4 (6.4-13.2)	25/303	8.3 (5.4-11.9)	9/286	3.1(1.4-5.9)
Any HR-HPV genotypes[8]		p=0.095*		p=0.142*		p=0.243		p=0.965
18-24 years	60/118	53.1 (44.7-61.3)	69/121	59.3 (51.0-67.3)	53/120	44.2 (35.1-53.5)	12/111	10.8 (5.7-18.1)
25-34 years	44/100	38.0 (28.1-48.8)	51/100	44.6 (34.2-55.3)	38/97	39.2 (29.4-49.6)	9/92	9.8 (4.6-17.8)
36-45 years	31/87	33.3 (22.2-46.0)	38/67	41.8 (29.8-54.5)	28/86	32.6 (22.8-43.5)	9/83	10.8 (5.1-19.6)
Overall	135/305	44.3 (38.6-50.0)	158/309	51.1 (45.4-56.8)	119/303	39.3 (33.7-45.0)	30/286	10.5 (7.2-14.6)
Any LR-HPV genotype[9]		**p=0.001***		**p=0.047***		p=0.495		p=0.891
18-24 years	60/118	50.8 (41.5-60.2)	66/121	54.5 (45.2-63.6)	56/120	46.7 (37.5-56.0)	11/111	9.9 (5.1-17.0)
25-34 years	41/100	41.0 (31.3-51.3)	50/100	50.0 (39.8-60.2)	44/97	45.4 (35.2-55.8)	8/92	8.7 (3.8-16.4)
35-45 years	22/87	25.3 (16.6-35.7)	33/88	37.5 (27.4-48.5)	33/86	38.4 (28.1-49.5)	9/83	10.8 (5.1-19.6)
Overall	123/305	40.3 (34.8-46.1)	149/309	48.2 (42.5-53.9)	133/303	43.9 (38.2-49.7)	28/286	9.8 (6.6-13.8)
Multiple HPV genotypes infection[10]		**p<0.001***		**p=0.012***		**p=0.014***		p=0.721[5]
18-24 years	54/118	45.8 (36.6-55.2)	59/121	48.7 (39.6-58.0)	51/120	42.5 (33.5-51.9)	4/111	3.6 (1.0-9.0)
25-34 years	29/100	29.0 (20.4-38.9)	42/100	42.0 (32.2-52.3)	31/97	32.0 (22.9-42.2)	4/92	4.3 (1.2-10.8)
35-45 years	18/87	20.7 (12.7-30.7)	25/88	28.4 (19.3-39.0)	20/86	23.3 (14.8-33.6)	5/83	6.0 (2.0-13.5)
Overall	101/305	33.1 (27.9-38.7)	126/309	40.8 (35.2-46.5)	102/303	33.7 (28.4-39.3)	13/286	4.5 (2.4-7.6)

1**-n/N – number of samples with positive HPV infection as numerator and total samples with valid result as denominator; **2-IARC** – International Agency for Research on Cancer (**- HPV genotypes in IARC classification that are not included in the Anyplex II HPV28 platform); **3- Class 1 IARC HPV** -16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59**; 4- Class 2A IARC HPV** - 68; **5**- Bartlett's test for equal variances were significant (p< 0.05) **; 6- Class 2B IARC HPV** - 5*, 8*, 26, 30*, 34*, 40, 42, 43, 44, 53, 54, 55*, 61, 66, 67*, 69, 70, 71*, 72*, 73, 81*, 82, 83*, 84*, 85*, 97*, IS39* and CP6108*; **7- Class 3 IARC HPV** - 6, 11; **8- HR-HPV Group** - Class 1 IARC HPV and Class 2A IARC HPV; **9**- **LR-HPV** - Class 2b IARC and Class 3 IARC; **10-** Multiple HPV infection- Detection of two or more genotypes of HPV by Anyplex II HPV28 from a sample. All invalid samples were excluded from the descriptive analysis*

The graphs in figures 4.7, 4.8, 4.9, 4.10 and 4.11 exhibited the distribution of HPV specific genotype prevalences with respect to the cervical, vulvar, anal and oral samples of the participants. The two most prevalent HR-HPV specific genotypes by anatomical site were HPV-35 (8.5% [95% CI, 5.6-12.2]) and HPV-39 (7.2% [95% CI, 4.6-10.7]) in the cervical samples; HPV-35 (8.7% [95% CI, 5.8-12.5]) and HPV-52 (8.1% [95% CI, 5.3-11.7]) in the vulvar samples; HPV-52 (8.9% [95% CI, 6.0-12.7]) and HPV-45 (7.3% [95% CI, 4.6-7.3]) in the anal samples; and HPV-51 (3.2% [95% CI, 1.5-5.9]) and HPV-18/35/39 (1.4% [95% CI, 0.4-3.5]) in the oral samples. HPV-42 was the commonest LR-HPV specific genotype detected in the anal (13.2% [95% CI, 9.6-17.5]), vulvar (12.6% [95% CI, 9.1-16.9]), cervical (11.2% [95% CI, 7.8-15.2]) and oral (3.8% [95% CI, 1.9-6.8]) samples. HPV-6 was the second most prevalent LR type in the cervical (6.2% [95% CI, 3.8-9.6]), anal (8.9% [95% CI, 6.0-12.7]) and oral (3.2% [95% CI, 1.5-5.9]) samples, while HPV-66 (10.7% [95% CI, 7.5-14.7]) and HPV-54 (6.2% [95% CI, 3.8-9.6]) were the second most detected in the vulvar and cervical samples, respectively.

Figure 4.7– Prevalence of specific HPV genotypes according to the four anatomical sites

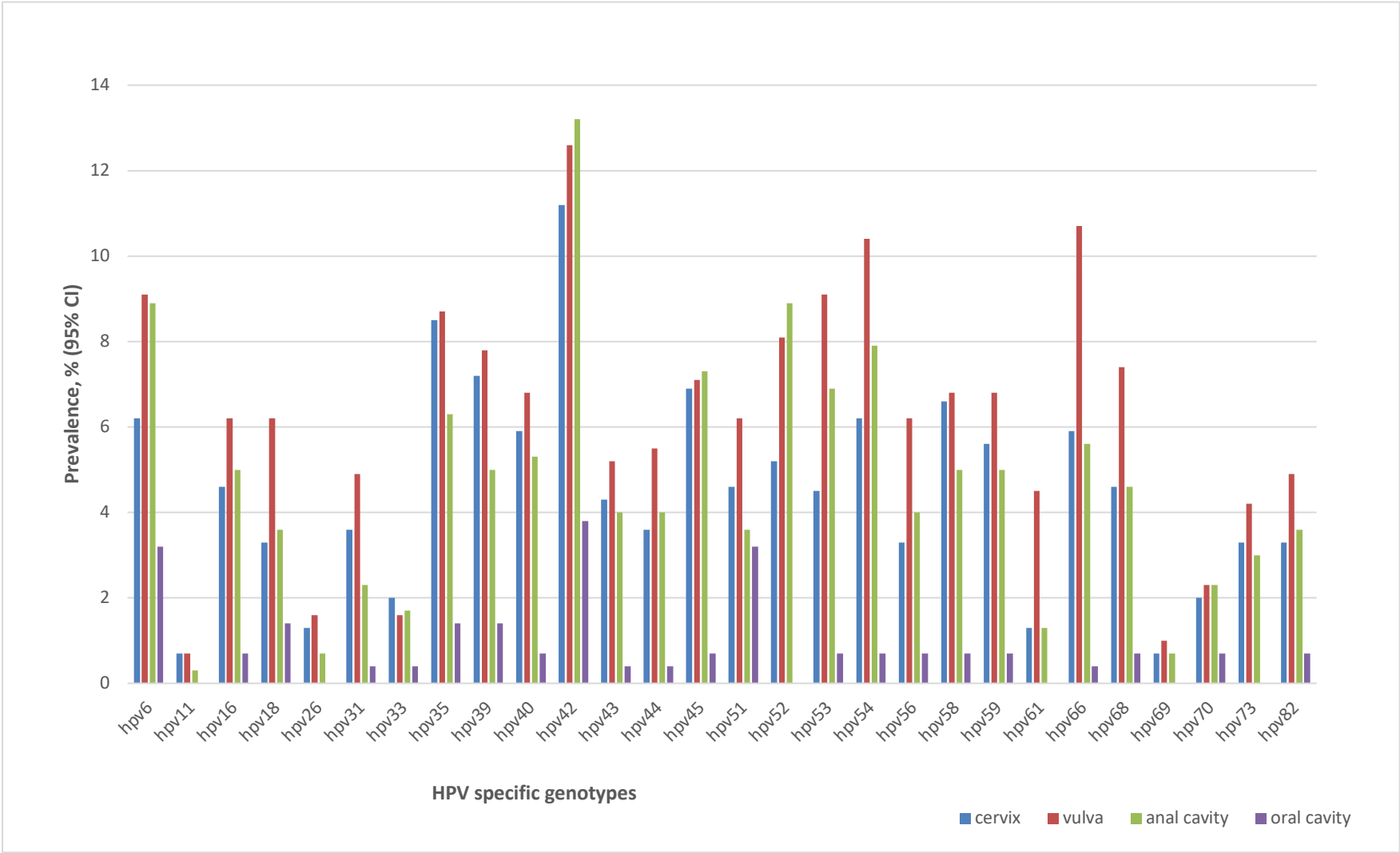
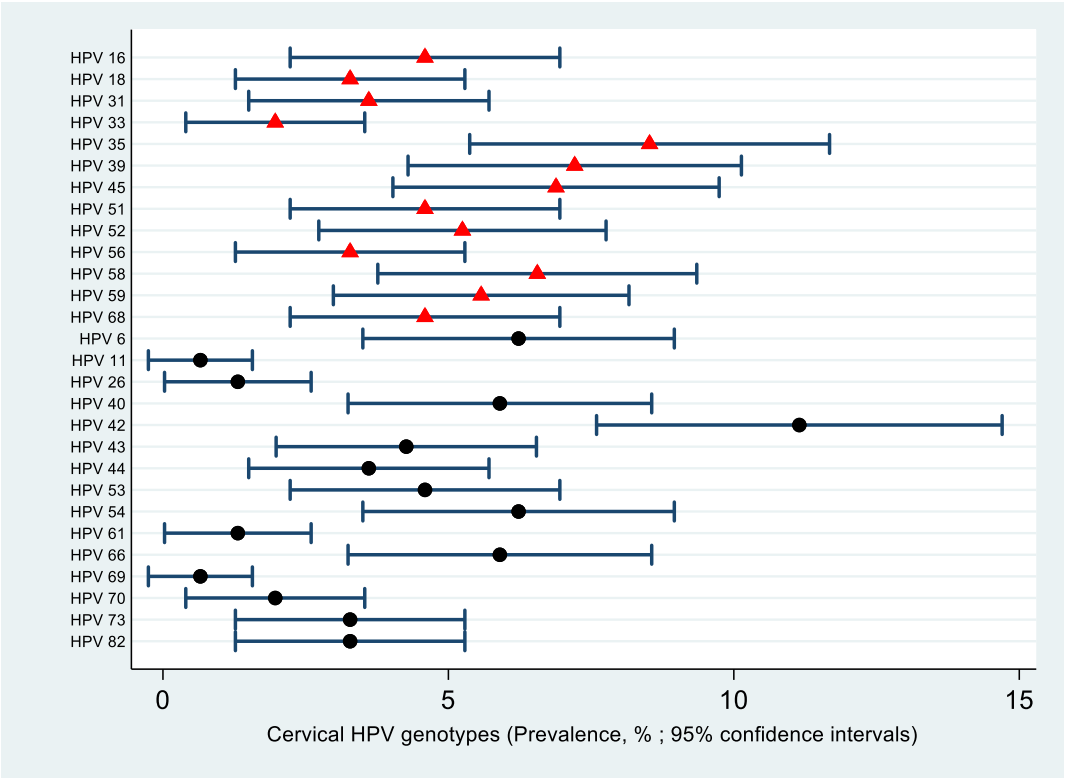
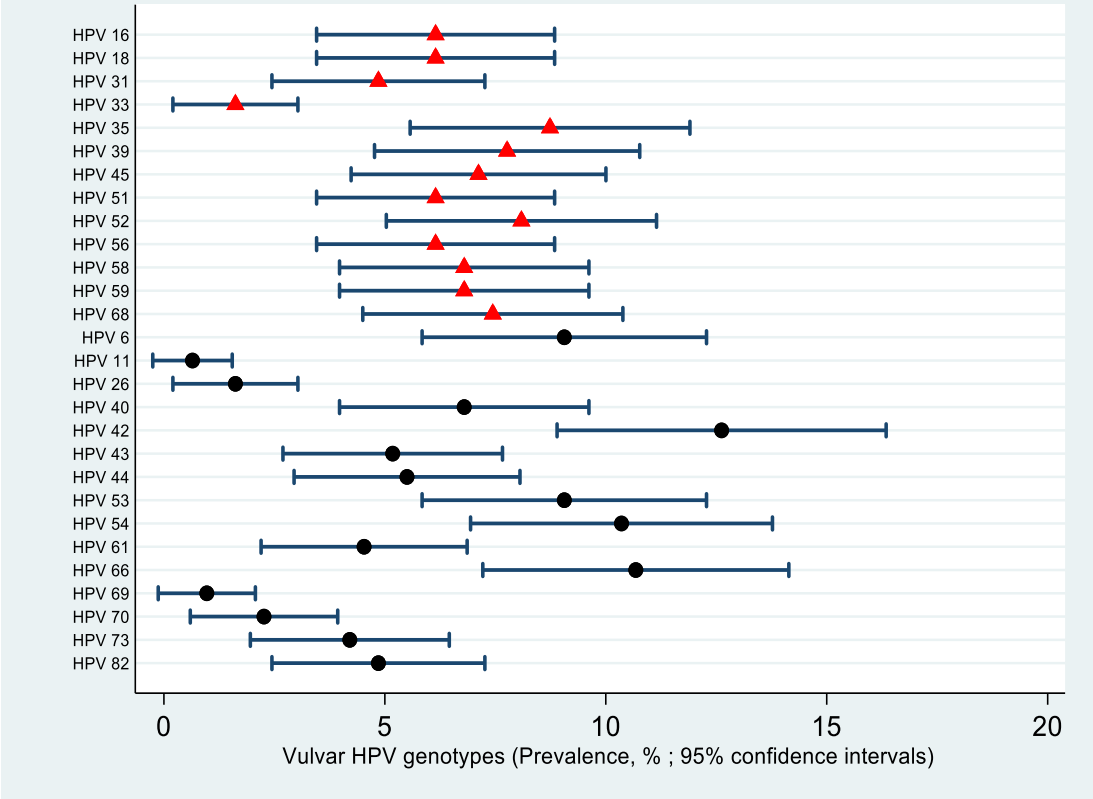


Figure 4.8 – Prevalence of specific cervical HPV genotypes



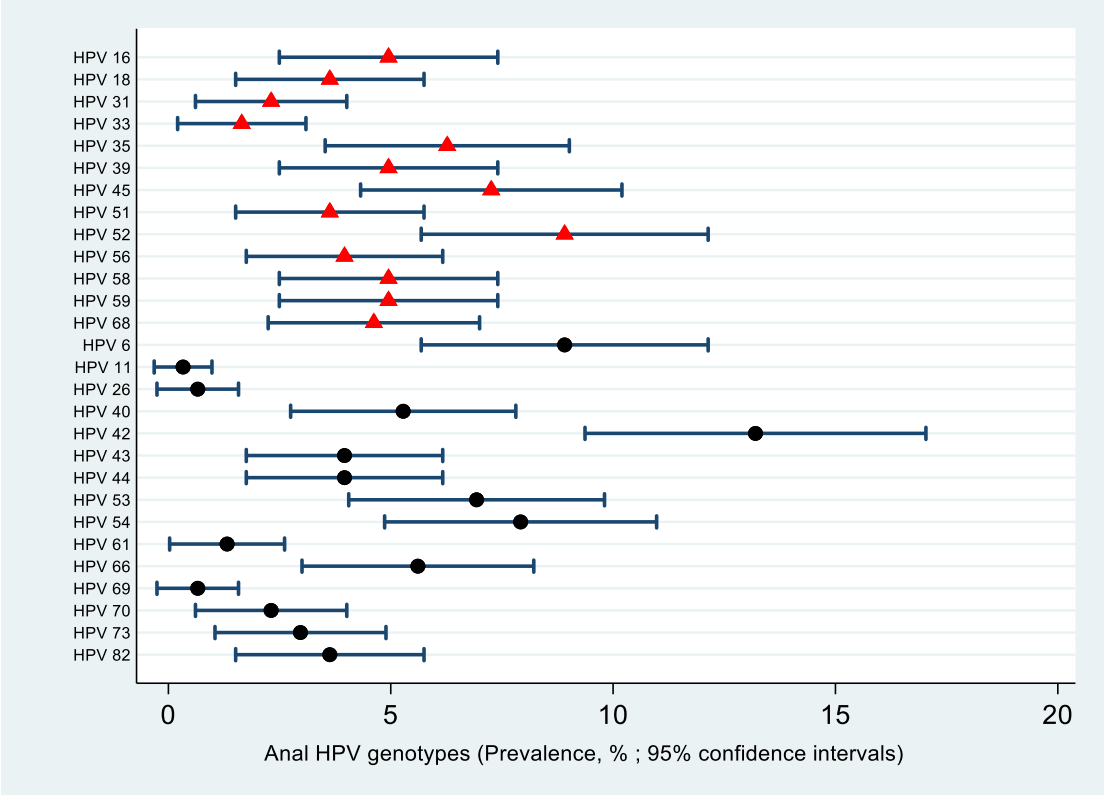
RED triangle indicates HR-HPV point prevalence and **BLACK BALL** indicates LR-HPV point prevalence with lines indicating 95% CI

Figure 4.9– Prevalence of specific vulvar HPV genotypes



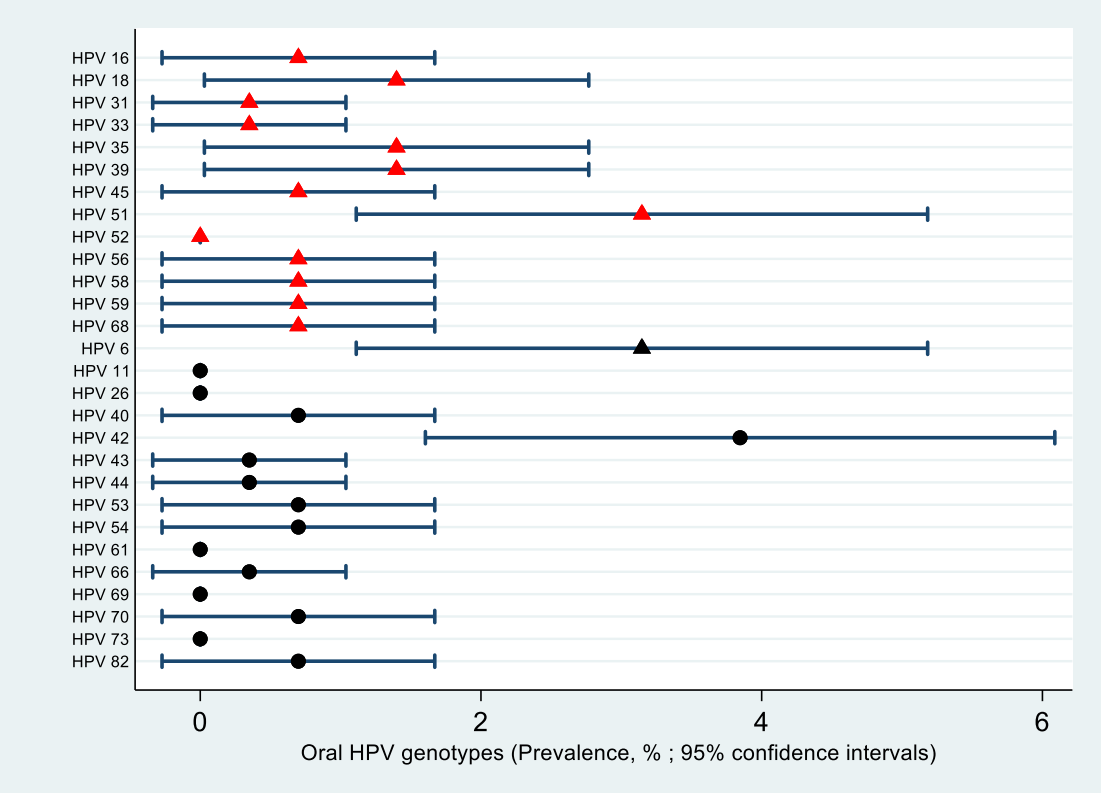
RED triangle indicates HR-HPV point prevalence and **BLACK BALL** indicates LR-HPV point prevalence with lines indicating 95% CI

Figure 4.10 – Prevalence of specific anal HPV genotypes



RED triangle indicates HR-HPV point prevalence and **BLACK BALL** indicates LR-HPV point prevalence with lines indicating 95% CI

Figure 4.11 – Prevalence of specific oral HPV genotypes



RED triangle indicates HR-HPV point prevalence and **BLACK BALL** indicates LR-HPV point prevalence with lines indicating 95% CI

4.3.3. Risk factors associated with cervical, vulvar, anal and oral HPV Infection

4.3.3.1. Risk factors associated with any cervical HPV Infection

Overall, 182 (60%) out of 305 participants had any cervical HPV infection. The results of the multivariable analyses for cervical HPV are shown in Table 4.7. In the unadjusted analyses, only the age of participants among all the level 1 factors was associated with cervical HPV infection. After adjusting for other sociodemographic factors in the model, age of the women remained associated with cervical HPV infection. Women aged 26-34 years and 35-45 years had 0.81 (95% CI, 0.46-1.41) and 0.44 (95% CI, 0.25-0.78) odds of having cervical HPV infection, respectively, compared to those aged 18-24 years.

For level 2 factors, the unadjusted analyses showed that number of lifetime vaginal sex partners, ever had oral sex (given or received), ever taken any illicit drugs and ever heard of HPV were associated with cervical HPV infection. After adjusting for confounders (level 1 core variables and Level 2 factors that were significant at p≤0.10), only the number of lifetime partner for vaginal sex remained significant. There was 1.54 (95%CI, 1.16-2.04) higher odds of having cervical HPV infection for a unit increase in number of lifetime partner for vaginal sex.

In the unadjusted analyses of level 3 factors, concomitant vulvar, anal and oral HPV infections were associated with cervical HPV infections. After adjusting for possible confounding (level 1 and 2 core variables, and any level 3 factors that were significant at p≤0.10), there was strong evidence that concomitant vulvar, anal and oral HPV infection remained associated with cervical HPV infection. The odds of detecting cervical HPV infections were 12.85 times (95%CI, 5.70-28.99), 4.37 times (95%CI, 1.50-12.71) and 3.48 times (95%CI, 1.74-6.96) in women that had concomitant vulvar, oral and anal HPV infections, respectively, compared to those with no HPV infections at these anatomical sites.

Table 4.7: Factors associated with cervical human papillomavirus infection among sexually active women from the general population in two communities in Ibadan, Nigeria

Variable	n/N (row, %)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHIC FACTORS (Level 1)			
Study site		p=0.413	p=0.576
Mokola	96/155(62%)	1	1
Moniya/Sasa	86/150(57%)	0.83(0.52-1.31)	0.82(0.51-1.31)
Age group, years		**p=0.015**	**p=0.018**
18-24	79/118(67%)	**1**	**1**
25-34	62/100(58%)	**0.81(0.46-1.41)**	**0.81(0.46-1.41)**
35-45	41/87(47%)	**0.44(0.25-0.78)**	**0.44(0.25-0.78)**
Ethnicity		p=0.175	p=0.258
Yoruba	136/236(58%)	1	1
Others[4]	46/69(67%)	1.47(0.84-2.58)	1.43(0.77-2.65)
Religion		p=0.840	p=0.648
Christianity/traditional	85/141(60%)	1	1
Islam	97/164(59%)	0.95(0.60-1.51)	0.89(0.55-1.46)
Highest education level		p=0.104	p=0.168
None and primary	32/62(52%)	1	1
Secondary	111/171(65%)	1.73(0.96-3.13)	1.48(0.81-2.72)
Tertiary	39/72(54%)	1.11(0.56-2.19)	0.90(0.45-1.83)
Quranic education		p=0.954	p=0.659
No	116/194(60%)	1	1
Yes	66/111(59%)	0.99(0.61-1.59)	0.89(0.55-1.46)
Occupation		p=0.409	p=0.551
No current paid job[5]	33/52(63%)	1	1
Unskilled worker	9/18(50%)	0.58(0.19-1.70)	0.75(0.25-2.30)
Semi-skilled worker	131/215(61%)	0.90(0.48-1.68)	1.11(0.58-2.15)
Skilled worker	9/20(45%)	0.47(0.17-1.34)	0.61(0.21-1.78)
Income per month[6]		p=0.407	p=0.175
No income	19/33(58%)	1	1
1 - 10,000N (1-28USD)	124/209(59%)	1.07(0.51-2.26)	1.26(0.57-2.79)
10,001 - 20,000N (>28 – 56USD)	33/49(67%)	1.52(0.61-3.79)	1.11(0.48-2.55)
> 20,000N (> 56USD)	6/24(43%)	0.55(0.16-1.96)	1.62(0.66-3.99)
Current marital status		p=0.107	p=0.334
Single[7]	54/79(68%)	1	1
Married & living as married	117/210(56%)	0.58(0.34-1.01)	0.79(0.43-1.46)
Divorced/Widowed/Separated[7]	11/16(69%)	1.02(0.32-3.24)	1.67(0.48-5.73)
BEHAVIOURAL FACTORS (Level 2)	**n/N (row, %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[8]**
Age at first vaginal sex, years[9]		p=0.642	p=0.700
≤ 15	20/32(63%)	1	1
16-17	26/42(62%)	0.98(0.38-2.52)	0.81(0.29-2.23)
≥ 18	133/225(59%)	0.87(0.40-1.86)	1.11(0.49-2.51)
Age difference between first vaginal sex partner and participant, years[10]		p=0.232	p=0.133
≤ 5	87/137(64%)	1	1
≥ 6	71/132(54%)	0.67(0.41-1.09)	0.78(0.46-1.31)
Number of lifetime partners for vaginal sex		**p=0.001**	**p=0.002**

number of vaginal sex partners (mean (SD))	1.91(1.41)	**1.46(1.16-1.84)**	**1.54(1.16-2.04)**
Ever cleansed inside the vagina[11]		p=0.294	p=0.409
No	18/35(51%)	1	1
Yes	164/270(61%)	1.46(0.72-2.96)	1.39(0.63-3.07)
Condom use during last vaginal sex		p=0.719	p=0.923
No	148/250(59%)	1	1
Yes	34/55(62%)	1.12(0.61-2.03)	0.97(0.50-1.86)
Ever had oral sex (given or received)		**p=0.008**	p=0.354
No	146/258(57%)	**1**	1
Yes	36/47(77%)	**2.51(1.22-5.15)**	1.46(0.65-3.27)
Ever had transactional sex		p=0.748	p=0.321
No	170/286(59%)	1	1
Yes	12/19(63%)	1.17(0.45-3.06)	0.56(0.18-1.74)
Ever had mutual masturbation[12]		p=0.130	p=0.133
No	38/73(52%)	1	1
Yes	144/232(62%)	1.51(0.89-2.56)	1.57(0.87-2.82)
Female genital mutilation[13]		p=0.445	p=0.516
No	88/142(62%)	1	1
Yes	94/163(58%)	0.84(0.53-1.32)	0.80(0.48-1.33)
Ever drank alcohol		p=0.179	p=0.571
No	128/223(57%)	1	1
Yes	54/82(66%)	1.43(0.84-2.43)	0.85(0.52-1.39)
Ever taken any illicit drugs[14]		**p=0.011**	p=0.105
No	165/285(58%)	**1**	1
Yes	17/20(85%)	**4.12(1.18-14.38)**	3.23(0.67-15.49)
Ever had an STI		p=0.381	p=0.895
No	155/264(59%)	1	1
Yes	27/41(66%)	1.36(0.68-2.71)	1.05(0.50-2.20)
Ever heard of HPV		**p=0.039**	p=0.091
No	173/282(61%)	**1**	1
Yes	9/23(39%)	**0.41(0.17-0.97)**	0.40(0.14-1.18)
BIOLOGICAL FACTORS (Level 3)	**n/N (row, %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**[15]
Vulvar HPV infection		**p<0.001**	**p<0.001**
No	16/98(16%)	**1**	**1**
Yes	166/207(80%)	**20.75(10.99-39.17)**	**12.85(5.70-28.99)**
Anal HPV infection[16]		**p<0.001**	**p<0.001**
No	39/130(30%)	**1**	**1**
Yes	138/168(82%)	**10.73(6.23-18.50)**	**3.48(1.74-6.96)**
Oral HPV infection[17]		**p<0.001**	**p<0.004**
No	127/236(54%)	**1**	**1**
Yes	38/45(84%)	**4.66(2.00-10.86)**	**4.37(1.50-12.71)**

1*- p-values were obtained from Wald tests;* ***2*** *– p values were obtained from Likelihood Ratio tests;* ***3****- Level 1 factors were adjusted for age and study site;* ***4****– Hausa/Fulani, Igbo and other minorities;* ***5****- Student, apprentice and no job;* ***6****–N – Naira- currency of Nigeria; USD –United States Dollar;* ***7****– Living alone;* ***8-*** *Level 2 factors were adjusted for age and study site (core variables from Level 1) and number of lifetime vaginal sex partners, ever had oral sex, mutual masturbation, illicit drug and ever heard of human papillomavirus;* ***9-*** *N=299 - six participants did not provide information on age at first vaginal sex;* ***10****- N=269 – 36 participants did not provide information to calculate the age difference between first vaginal sex partner and participant;* ***11****- Cleansing of vagina was defined as using water or another substance to clean inside of vagina by inserting half or whole finger;* ***12****- The mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No);* ***13****- Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No);* ***14-*** *Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria;* ***15-****Level 3 factors were adjusted for (core variables from Level 1), Level 2 factors (number of lifetime vaginal sex partners, illicit drug and ever heard about human papillomavirus), and various biological factors, such as the detection of HPV genotype in the vulvar and anal and oral cavities of the participant;* ***16****- N=298-seven participants did not have anal HPV results;* ***17****- N=281-24 participants did not have oral HPV results*

4.3.3.2. Risk factors associated with any vulvar HPV Infection

Two hundred and ten women (68%) out of 309 had detectable HPV infection on their vulva. Table 4.8 shows the results of the regression model for vulva HPV infection. The unadjusted analyses of level 1 factors established that there was strong evidence of association between vulvar HPV infection and current marital status. After adjusting for possible confounders, there was still evidence of an association with current marital status of participants (p=0.02). There was a lower odds (aOR=0.49, 95% CI, 0.25-0.99) of vulvar HPV infection among married or living as married women relative to single women.

The age difference between first vaginal sex partner and the participant, number of lifetime vaginal sex partners, history of ever drinking alcohol and illicit drug use were associated with detection of any HPV in the vulva in unadjusted analyses of level 2 factors (Table 4.8). After adjusting for possible confounders, the age difference between first vaginal sex partner (p=0.026) and the participant and the number of lifetime partners for vaginal sex partners (p<0.001) were still associated with vulvar HPV infection. Women whose age difference with their first vaginal sex partner was six years and above had lower odds (aOR=0.51, 95% CI, 0.29-0.90) of vulvar HPV infection compared to women who had five or less vaginal sex partners. The odds of having any vulvar HPV infection among women was 2.03 (95% CI, 1.38-3.01) times higher with increasing number of lifetime partners for vaginal sex.

In the unadjusted analyses of level 3 factors, presence of concomitant HPV infection in the cervix, as well as the anal and oral cavities of participants were associated with detectable vulvar HPV infection. After adjusting for possible confounders, only the presence of concomitant cervical and anal HPV infection remained associated with vulvar HPV infection (p<0.001). Women with concomitant cervical (aOR=22.19, 95 %CI 7.85-62.72) and anal (aOR=6.68, 95% CI 2.44-18.26) HPV infection had higher odds of vulvar HPV infection relative to those with no concomitant infections at both anatomical sites.

Table 4.8: Factors associated with vulvar human papillomavirus infection among sexually active women from the general population in two communities in Ibadan, Nigeria

Variable	n/N (row, %)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHIC FACTORS (Level 1)			
Study site		p=0.942	p=0.373
Mokola	107/157(68%)	1	1
Moniya/Sasa	103/152(68%)	0.98(0.61-1.58)	1.27(0.75-2.13)
Age group, years		p=0.525	p=0.509
18-24	86/121(71%)	1	1
25-34	68/100(68%)	0.86(0.49-1.54)	0.89(0.49-1.63)
35-45	56/88(61%)	0.71(0.40-1.28)	0.67(0.34-1.33)
Ethnicity		p=0.676	p=0.589
Yoruba	161/239(67%)	1	1
Others[4]	49/70(70%)	1.13(0.63-2.02)	1.22(0.63-2.38)
Religion		p=0.541	p=0.544
Christianity/traditional	99/142(70%)	1	1
Islam	111/167(66%)	0.86(0.53-1.39)	0.80(0.47-1.36)
Highest education level		p=0.749	p=0.580
None and primary	41/62(66%)	1	1
Secondary	122/175(70%)	1.18(0.64-2.18)	1.05(0.54-2.02)
Tertiary	47/72(65%)	0.96(0.47-1.97)	0.71(0.32-1.57)
Quranic education		p=0.840	p=0.897
No	134/196(68%)	1	1
Yes	76/113(67%)	0.95(0.58-1.56)	0.94(0.55-1.59)
Occupation		p=0.791	p=0.878
No current paid job[5]	39/54(72%)	1	1
Unskilled worker	12/18(67%)	0.77(0.24-2.42)	0.71(0.14-3.55)
Semi-skilled worker	147/217(68%)	0.81(0.42-1.56)	0.86(0.24-3.15)
Skilled worker	12/20(60%)	0.58(0.20-1.69)	0.66(0.13-3.24)
Income per month[6]		p=0.207	p=0.057
No income	24/35(69%)	1	1
1 - 10,000N (1-28USD)	79/125(65%)	0.79(0.35-1.75)	0.99(0.43-2.30)
10,001 - 20,000N (>28 – 56USD)	57/85(86%)	0.93(0.40-2.17)	1.43(0.57-3.57)
> 20,000N (> 56USD)	50/64(50%)	1.64(0.65-4.14)	2.62(0.96-7.13)
Current marital status		**p=0.040**	**p=0.027**
Single[7]	63/82(77%)	**1**	**1**
Married & living as married	134/211(64%)	**0.52(0.29-0.94)**	**0.49(0.25-0.99)**
Divorced/Widowed/Separated[7]	13(81%)	**1.31(0.34-5.07)**	**1.64(0.38-7.00**
BEHAVIOURAL FACTORS (Level 2)	**n/N (row, %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[8]**
Age at first vaginal sex, years[9]		p=0.612	p=0.276
≤ 15	25/33(76%)	1	1
16-17	28/42(67%)	0.64(0.23-1.78)	0.44(0.12-1.58)
≥ 18	154/228(68%)	0.67(0.29-1.55)	0.87(0.29-2.56)
Age difference between first vaginal sex partner and participant, years[10]		**p=0.002**	**p=0.026**
≤ 5	106/139(76%)	**1**	**1**
≥ 6	79/134(59%)	**0.45(0.27-0.75)**	**0.51(0.29-0.90)**
Number of lifetime partners for vaginal sex		**p<0.001**	**p<0.001**

number of vaginal sex partners (mean (SD))	1.91(1.41)	**1.59(1.21-2.07)**	**2.03(1.38-3.01)**
Ever cleansed inside the vagina[11]		p=0.097	p=0.072
No	20/36(56%)	1	1
Yes	190/273(70%)	1.83(0.90-3.71)	2.61(0.91-8.77)
Condom use during last vaginal sex		p=0.204	p=0.701
No	168/253(66%)	1	1
Yes	42/56(75%)	1.52(0.79-2.93)	2.76(0.97-7.88)
Ever had oral sex (given or received)		p=0.131	p=0.802
No	173/261(66%)	1	1
Yes	37/48(77%)	1.71(0.83-3.52)	1.12(0.45-2.81)
Ever had transactional sex		p=0.272	p=0.276
No	195/290(67%)	1	1
Yes	15/19(79%)	1.83(0.59-5.65)	0.44(0.10-1.87)
Ever had mutual masturbation[12]		p=0.162	p=0.204
No	46/75(61%)	1	1
Yes	164/234(70%)	1.48(0.86-2.54)	1.55(0.79-3.02)
Female genital mutilation[13]		p=0.443	p=0.758
No	101/144(70%)	1	1
Yes	109/165(66%)	0.83(0.51-1.34)	1.09(0.62-1.94)
Ever drank alcohol		**p=0.012**	p=0.864
No	144/225(64%)	**1**	1
Yes	66/84(79%)	**2.06(1.15-3.71)**	1.07(0.52-2.19)
Ever taken any illicit drugs[14]		**p=0.008**	p=0.080
No	190/287(66%)	**1**	1
Yes	20/22(91%)	**5.10(1.17-22.29)**	4.95(0.58-41.88)
Ever had an STI		p=0.209	p=0.558
No	178/267(68%)	1	1
Yes	32/42(76%)	1.60(0.75-3.40)	1.29(0.54-3.07)
Ever heard of HPV		p=0.232	p=0.781
No	197/286(69%)	1	1
Yes	13/23(57%)	0.59(0.25-1.39)	0.85(0.25-2.76)
BIOLOGICAL FACTORS (Level 3)	**n/N (row, %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**[15]
Cervical HPV infection[16]		**p<0.001**	**p<0.001**
No	41/123(33%)	**1**	**1**
Yes	166/182(91%)	**20.75(10.99-39.17)**	**22.19(7.85-62.72)**
Anal HPV infection[17]		**p<0.001**	**p<0.001**
No	53/131(40%)	**1**	**1**
Yes	156/171(91%)	**15.31(8.12-28.86)**	**6.68(2.44-18.26)**
Oral HPV infection[18]		**p=0.016**	p=0.362
No	156/239(65%)	**1**	1
Yes	38/46(83%)	**2.53(1.13-5.67)**	0.53(0.14-2.04)

1*- p-values were obtained from Wald tests;* ***2*** *– p values were obtained from Likelihood Ratio tests;* ***3****- Level 1 factors were adjusted for age, study site, monthly income and current marital status;* ***4****– Hausa/Fulani, Igbo and other minorities;* ***5****– Student, apprentice and no job;* ***6****– N – Naira-currency of Nigeria; USD –United States Dollar;* ***7****– Living alone;* ***8-*** *Level 2 factors were adjusted for age, study site monthly income and current marital status (core variables from Level 1) and various behavioural factors - age difference between first vaginal sex partner and participant, number of lifetime vaginal sex partners, cleansed inside vaginal, alcohol and illicit drug;* ***9-*** *N=303 -six participants did not provide information on age at first vaginal sex;* ***10****- N=273 – 36 participants did not provide information to calculate age difference between first vaginal sex partner and participant;* ***11****- Cleansing of vagina was defined as using water or another substance to clean inside of vagina by inserting half or whole finger;* ***12****- The mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No);* ***13****- Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No);* ***14-*** *Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria;* ***15****- Level 3 factors were adjusted for (core variables from Level 1), Level 2 factors (age difference between first vaginal sex partner and participant, number of lifetime vaginal sex partners, cleansed inside vaginal, and illicit drug) and detection of HPV genotype in the cervical and anal cavity of participant;* ***16****- N=305 – four participants did not have cervical HPV results;* ***17****- N=302-seven participants did not have anal HPV results;* ***18-*** *N=285-24 participants did not have oral HPV results*

4.3.3.3. Risk factors associated with any anal HPV Infection

Of the 303 women whose anal samples were analysed, 171 (56%) had detectable HPV infection. The results of the logistical regression models for anal HPV infection is shown in Table 4.9. Of the level 1 factors, study sites, monthly income and current marital status were associated with anal HPV infection in the unadjusted analyses, but none was significantly associated in the adjusted model.

In the unadjusted analyses of level 2 factors (Table 4.9), age difference between first vaginal sex partners and participants, number of life time partners for vaginal sex, alcohol, illicit drug use, previous history of STI and ever heard of HPV were associated with any HPV infection. After adjusting for possible confounders, only age difference between first vaginal sex partners and participants (p=0.050) and number of lifetime partners for vaginal sex (p<0.001) remained associated with detection of anal HPV infection. Women whose age difference with her first vaginal sex partner was six years or more had lower odds (aOR=0.58, 95% CI 0.34-1.00) of having anal HPV infection compared to women that had an age difference of five years and below. The odds of anal HPV infections were 1.92 (95% CI, 1.35-2.71) higher for each unit increase in number of lifetime partner for vaginal sex.

The presence of concomitant HPV infection in the cervix, vulvar and oral cavity were found to be associated with detection of anal HPV infection in the unadjusted analyses. After adjusting for possible confounders, there was strong evidence of an association between concurrent cervical and vulvar HPV infection and any anal HPV infection. The odds of having anal HPV was higher in women with concomitant cervical (aOR=4.10, 95% CI, 1.85-9.11) and vulvar (aOR=5.47, 95% CI, 2.11-14.20) HPV infection compared with those without HPV infections at these anatomical sites.

Table 4.9: Factors associated with anal human papillomavirus infection among sexually active women from the general population in two communities in Ibadan, Nigeria

Variable	n/N (row, %)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHIC FACTORS (Level 1)			
Study site		**p=0.010**	p=0.075
Mokola	98/153(64%)	**1**	1
Moniya/Sasa	74/150(49%)	**0.55(0.35-0.87)**	0.63(0.38-1.05)
Age group, years		p=0.122	p=0.521
18-24	74/120(62%)	1	1
25-34	57/97(59%)	0.89(0.51-1.53)	0.96(0.54-1.72)
35-45	41/86(48%)	0.57(0.32-0.99)	0.70(0.37-1.35)
Ethnicity		p=0.612	p=0.920
Yoruba	131/234(56%)	1	1
Others[4]	41/69(59%)	1.15(0.67-1.99)	0.97(0.51-1.83)
Religion		p=0.451	p=0.945
Christianity/traditional	81/137(59%)	1	1
Islam	91/166(55%)	0.84(0.53-1.33)	0.98(0.59-1.65)
Highest education level		p=0.269	p=0.556
None and primary	29/61(48%)	1	1
Secondary	101/171(59%)	1.59(0.88-2.87)	1.32(0.71-2.46)
Tertiary	42/71(59%)	1.60(0.80-3.19)	1.02(0.48-2.15)
Quranic education		p=0.998	p=0.857
No	109/192(57%)	1	1
Yes	63/111(57%)	1.00(0.62-1.60)	1.05(0.63-1.73)
Occupation		p=0.121	p=0.520
No current paid job[5]	37/54(69%)	1	1
Unskilled worker	11/18(61%)	0.72(0.24-2.19)	1.22(0.26-5.70)
Semi-skilled worker	116/211(55%)	0.56(0.30-1.06)	1.11(0.33-3.76)
Skilled worker	8/20(40%)	0.31(0.11-0.89)	0.53(0.12-2.40)
Income per month[6]		**p=0.070**	p=0.084
No income	23/35(66%)	**1**	1
1 - 10,000N (1-28USD)	67/122(55%)	**0.64(0.29-1.39)**	0.75(0.33-1.69)
10,001 - 20,000N (>28 – 56USD)	39/82(48%)	**0.47(0.21-1.08)**	2.33(0.85-6.42)
> 20,000N (> 56USD)	43/64(67%)	**1.07(0.45-2.55)**	0.79(0.21-2.94)
Current marital status		**p<0.001**	p=0.073
Single[7]	61/82(74%)	**1**	1
Married & living as married	104/206(50%)	**0.35(0.20-0.62)**	0.47(0.24-0.91)
Divorced/Widowed/Separated[7]	7/15(47%)	**0.30(0.10-0.93)**	0.44(0.13-1.48)
BEHAVIOURAL FACTORS (Level 2)	**n/N(row, %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[8]**
Age at first vaginal sex, years[9]		p=0.255	p=0.252
≤ 15	23/33(70%)	1	1
16-17	22/42(52%)	0.48(0.18-1.25)	0.41(0.13-1.33)
≥ 18	124/222(56%)	0.55(0.25-1.21)	0.75(0.29-1.99)
Age difference between first vaginal sex partner and participant, years[10]		**p=0.005**	**p=0.050**
≤ 5	91/138(66%)	**1**	**1**
≥ 6	63/129(46%)	**0.49(0.30-0.81)**	**0.58(0.34-1.00)**
Number of lifetime partners for vaginal sex		**p<0.001**	**p<0.001**

(Mean (SD))	1.89(1.40)	**1.50(1.19-1.90)**	**1.92(1.35-2.71)**
Ever cleansed inside the vagina[11]		p=0.876	p=0.573
No	20/36(56%)	1	1
Yes	152/267(57%)	1.06(0.52-2.13)	1.32(0.50-3.48)
Condom use during last vaginal sex		p=0.508	p=0.967
No	138/247(56%)	1	1
Yes	34/56(61%)	1.22(0.68-2.21)	1.32(0.50-3.48)
Ever had oral sex (given or received)		p=0.205	p=0.850
No	142/257(55%)	1	1
Yes	30/46(65%)	1.52(0.79-2.92)	0.92(0.41-2.08)
Ever had transactional sex		p=0.376	p=0.145
No	160/285(56%)	1	1
Yes	12/18(67%)	1.56(0.57-4.28)	0.37(0.10-1.40)
Ever had mutual masturbation[12]		p=0.402	p=0.959
No	40/76(53%)	1	1
Yes	132/227(58%)	1.25(0.74-2.10)	1.02(0.54-1.93)
Female genital mutilation[13]		p=0.938	p=0.584
No	78/138(57%)	1	1
Yes	94/165(57%)	1.02(0.65-1.61)	1.17(0.67-2.02)
Ever drank alcohol		**p=0.003**	p=0.696
No	115/222(52%)	**1**	1
Yes	57/81(70%)	**2.21(1.28-3.81)**	1.15(0.58-2.26)
Ever taken any illicit drugs[15]		**p=0.010**	p=0.168
No	154/281(55%)	**1**	1
Yes	18/22(82%)	**3.71(1.22-11.24)**	2.63(0.61-11.33)
Ever had an STI		**p=0.014**	p=0.303
No	141/261(54%)	**1**	1
Yes	31/42(74%)	**2.40(1.16-4.98)**	1.54(0.67-3.50)
Ever heard of HPV		**p=0.014**	p=0.077
No	165/281(59%)	**1**	1
Yes	7/12(32%)	**0.33(0.13-0.83)**	0.35(0.11-1.17)
BIOLOGICAL FACTORS (Level 3)	**n/N(row, %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[16]**
Cervical HPV infection[17]		**p<0.001**	**p<0.001**
No	30/121(25%)	**1**	**1**
Yes	138/177(78%)	**10.73(6.23-18.50)**	**4.10(1.85-9.11)**
Vulvar HPV infection[18]		**p<0.001**	**p<0.001**
No	15/93(16%)	**1**	**1**
Yes	156/209(75%)	**15.31(8.11-28.86)**	**5.85(2.35-14.59)**
Oral HPV infection[19]		**p<0.001**	p=0.119
No	122/234(52%)	**1**	1
Yes	36/46(78%)	**3.30(1.57-6.97)**	2.13(0.80-5.64)

1*- p-values were obtained from Wald tests;* ***2*** *– p values were obtained from Likelihood Ratio tests;* ***3****- Level 1 factors were adjusted for age, study site, monthly income and current marital status;* ***4****- Hausa/Fulani, Igbo and other minorities;* ***5****– Student, apprentice and no job;* ***6****– N – Naira- currency of Nigeria; USD –United States Dollar;* ***7****– Living alone;* ***8****- Level 2 factors were adjusted for age, study site monthly income and current marital status (core variables from Level 1) and various behavioural factors - age difference between first vaginal sex partner and participant, number of lifetime vaginal sex partners, alcohol and illicit drug;* ***9****-N=297 -six participants did not provide information on age at first vaginal sex;* ***10****- N=267 – 36 participants did not provide information to calculate age difference between first vaginal sex partner and participant;* ***11****- Cleansing of vagina was defined as using water or another substance to clean inside of vagina by inserting half or whole finger;* ***12****- The mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No);* ***13****- Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No);* ***14****- Cigarette smoking was excluded from the regression model because of small observations;* ***15-*** *Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria;* ***16****- Level 3 factors were adjusted for (core variables from Level 1), Level 2 factors (age difference between first vaginal sex partner and participant, number of lifetime vaginal sex partners,ever heard about human papillomavirus), and detection of HPV genotype in the cervix, and vulvar of participant;* ***17****- N=298 – five participants did not have cervical HPV results;* ***18****- N=302-one participant did not have vulvar HPV results;* ***19****- N=280-23 participants did not have oral HPV results*

4.3.3.4. Risk factors associated with any oral HPV Infection

Forty-six (16.1%) out of two hundred and eighty-six participants had any oral HPV infection. Out of all Level 1 factors, study site was associated with any oral HPV infection in the unadjusted and adjusted analyses (Table 4.10). There were lower odds of having oral HPV infection in women in Moniya/Sasa (aOR=0.38, 95% CI, 0.19-0.74) compared to those in Mokola. None of the level 2 factors was established to be associated with oral HPV infection in both unadjusted and adjusted analyses.

For level 3 factors, having a positive rapid HIV result and concomitant cervical, vulvar and anal HPV infections were all associated with having oral HPV infection in the unadjusted analyses. After adjusting for possible confounders, only concomitant cervical HPV infection was found to be associated with oral HPV infection. The odds of having oral HPV infection was 4.81 (95%CI, 1.58-14.62) higher in women with concomitant cervical HPV infection than those with no HPV infection in the cervix (Table 4.10).

Table 4.10: Factors associated with oral human papillomavirus infection among sexually active women from the general population in two communities in Ibadan, Nigeria

Variable	**n/N(row, %)**	**p-value[1]** **Crude OR (95%CI)**	**p-value[2]** **Adjusted OR (95%CI)[3]**
SOCIO-DEMOGRAPHIC FACTORS (Level 1)			
Study site		**p=0.003**	**p=0.004**
Mokola	32/143(23%)	**1**	**1**
Moniya/Sasa	14/143(10%)	**0.38(0.19-0.74)**	**0.38(0.19-0.74)**
Age group, years		p=0.664	p=0.693
18-24	20/111(18%)	1	1
25-34	15/92(16%)	0.89(0.43-1.85)	0.80(0.38-1.68)
35-45	11/83(13%)	0.70(0.31-1.54)	0.72(0.32-1.61)
Ethnicity		p=0.786	p=0.316
Yoruba	35/222(16%)	1	1
Others[4]	11/64(17%)	1.11(0.53-2.33)	0.67(0.30-1.49)
Religion		p=0.678	p=0.767
Christianity/traditional	23/135(17%)	1	1
Islam	23/151(15%)	0.88(0.47-1.64)	1.11(0.56-2.17)
Highest education level		p=0.866	p=0.904
None and primary	8/57(14%)	1	1
Secondary	28/165(17%)	1.25(0.53-2.93)	1.15(0.48-2.77)
Tertiary	10/64(16%)	1.13(0.41-3.10)	0.99(0.35-2.78)
Quranic education		p=0.842	p=0.968
No	29/184(16%)	1	1
Yes	17/102(17%)	1.07(0.56-2.06)	1.01(0.52-1.98)
Occupation		p=0.935	p=0.984
No current paid job[5]	9/50(18%)	1	1
Unskilled worker	3/17(18%)	0.98(0.23-4.12)	1.14(0.26-4.99)
Semi-skilled worker	32/202(16%)	0.86(0.38-1.94)	1.09(0.46-2.55)
Skilled worker	2/17(12%)	0.61(0.12-3.14)	0.83(0.15-4.51)
Income per month[6]		p=0.556	p=0.700
No income	6/34(18%)	1	1
1 - 10,000N (1-28USD)	16/112(14%)	0.78(0.28-2.18)	0.83(0.29-2.36)
10,001 - 20,000N (>28 – 56USD)	16/77(21%)	1.22(0.43-3.46)	1.17(0.40-3.41)
> 20,000N (> 56USD)	8/63(13%)	0.68(0.21-2.15)	0.69(0.21-2.31)
Current marital status		p=0.323	p=0.497
Single[7]	14/75(19%)	1	1
Married and living as married	28/197(14%)	0.72(0.36-1.46)	1.11(0.50-2.45)
Divorced/Widowed/Separated[7]	4/14(29%)	1.74(0.48-6.38)	2.42(0.60-9.76)
BEHAVIOURAL FACTORS (Level 2)	**n/N(row, %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[8]**
Age at first vaginal sex, years[9]		p=0.082	p=0.202
≤ 15	3/31(20%)	1	1
16-17	11/39(15%)	3.67(0.92-14.57)	3.19(0.78-13.04)
≥ 18	31/211(12%)	0.55(0.14-2.09)	1.76(0.50-6.22)
Age difference between first vaginal sex partner and participant, years[10]		p=0.617	p=0.570
≤ 5	24/134(18%)	1	1
≥ 6	19/122(16%)	0.85(0.44-1.63)	0.82(0.42-1.61)
Number of lifetime partners for vaginal sex (Mean (SD))	1.89(1.43)	p=0.198 1.14(0.94-1.38)	p=0.404 1.09(0.89-1.33)

Condom use during last vaginal sex		p=0.125	p=0.310
No	34/235(14%)	1	1
Yes	12/51(24%)	1.82(0.87-3.82)	1.50(0.70-3.22)
Ever had oral sex (given or received)		p=0.685	p=0.909
No	38/242(16%)	1	1
Yes	8/44(18%)	1.19(0.51-2.77)	1.05(0.44-2.50)
Ever cleansed inside the vagina[11]		p=0.410	p=0.977
No	7/33(21%)	1	1
Yes	39/253(15%)	0.68(0.27-1.67)	1.01(0.40-2.60)
Ever had transactional sex		p=0.284	p=0.266
No	42/271(16%)	1	1
Yes	4/15(27%)	1.98(0.60-6.52)	2.04(0.59-7.13)
Ever had mutual masturbation[12]		p=0.875	p=0.508
No	11/71(16%)	1	0.76(0.34-1.69)
Yes	35/215(16%)	1.06(0.51-2.22)	
Female genital mutilation[13]		p=0.935	p=0.696
No	21/129(16%)	1	1
Yes	25/157(16%)	0.97(0.52-1.84)	1.14(0.59-2.19)
Ever drank alcohol		p=0.199	p=0.710
No	30/209(14%)	1	1
Yes	16/77(21%)	1.57(0.80-3.07)	1.15(0.56-2.35)
Ever taken any illicit drug[15]		p=0.813	p=0.437
No	43/265(16%)	1	1
Yes	3/31(14%)	0.86(0.24-3.05)	0.61(0.17-2.23)
Ever had an STI		p=0.286	p=0.511
No	37/245(15%)	1	1
Yes	9/41(22%)	1.58(0.70-3.58)	1.33(0.57-3.09)
Ever heard of HPV		p=0.890	p=0.887
No	43/266(16%)	1	1
Yes	3/20(15%)	0.92(0.26-3.26)	1.10(0.30-4.04)
BIOLOGICAL FACTORS (Level 3)	**n/N(row, %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[16]**
Cervical HPV infection[17]		**p<0.001**	**p=0.003**
No	7/116(6%)	**1**	**1**
Yes	38/165(23%)	**4.66(2.00-10.86)**	**4.81(1.58-14.62)**
Vulvar HPV infection[18]		**p=0.016**	p=0.371
No	8/91(9%)	**1**	1
Yes	38/194(20%)	**2.53(1.13-5.67)**	0.57(0.17-1.95)
Anal HPV infection[19]		**p<0.001**	p=0.136
No	10/122(8%)	**1**	1
Yes	36/158(23%)	**3.30(1.57-6.97)**	2.02(0.78-5.25)

1- p-values were obtained from Wald tests; **2** – p values were obtained from Likelihood Ratio tests; **3**- Level 1 factors were adjusted for age and study site; **4**– Hausa/Fulani, Igbo and other minorities; **5**– Student, apprentice and no job; **6**– N – Naira- currency of Nigeria; USD –United States Dollar; **7**– Living alone; **8-** Level 2 factors were adjusted for age and study site (core variables from Level 1) only because none of the Level 2 factors had a Likelihood Ratio test p-value of ≤0.1; **9-**N=281 **-**five participants did not provide information on age at first vaginal sex; **10**- N=256 – 30 participants did not provide information to calculate age difference between first vaginal sex partner and participant; **11**- Cleansing of vagina was defined as using water or another substance to clean inside of vagina by inserting half or whole finger; **12**- The mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No); **13**- Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No); **14 -** Cigarette smoking was excluded from the regression model because of empty cells **15-**Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria; **16**- Level 3 factors were adjusted for (core variables from Level 1) and biological factor detection of HPV genotype in cervix of participant; **17**- N=281-five participants did not have cervical HPV results; **18**- N=285-one participant did not have vulvar HPV results; **19**- N=280- six participant did not have vulvar HPV results

4.3.4. Concordance of genotype specific HPV infection

Thirty one out of 310 women had concordance of any HPV in the four anatomical sites of the cervix, vulvar, anal and oral cavities. Moreover, 15 of these women had concordance of HR-HPV genotypes (Table 4.11). Of those that had concordance of HR-HPV in the four anatomical sites, two women each had HPV-16, 18, 39, 51, 58 and 59 detected in all the four anatomical sites. Out of 16 participants that had concordance of LR-HPV genotypes in the four anatomic sites, HPV-42 was the most prevalent type detected in five women followed by HPVs-6, 40 and 82 in two women each. Participants who had concordant HPV specific genotypes in any of the three anatomical sites, HPV-45, 39, 59 and 16 of HR types were found in twelve, eleven, ten and nine women, respectively. HPV-42 in 20 women, HPV-6 and 54 in 13 women and HPV-66 in 10 women were LR group detected in three anatomical sites.

The concordance of HPV genotype between any two anatomical site samples of participants (Table 4.12) showed that the concordance of HR-HPV was highest in the cervical and vulvar samples (116/309; 37.5%), followed by the anal and vulvar samples (104/310; 33.5%) and the cervical and anal samples (92/310; 29.7%). The lowest concordance of any HR-HPV genotype was between the oral and vulvar samples (21/309; 6.8%). The concordance of any LR-HPV genotype between two anatomical sites samples was also highest in the cervical and vulvar samples (123/305; 40.3%), followed by the cervical and anal samples (95/310; 30.6%) and the cervical and vulvar samples (95/310; 30.6%). The lowest concordance of any LR-HPV genotype was between the oral samples and the cervical samples (16/310; 5.2%).

Table 4.11: Proportion of HPV genotype specific concordance samples across the four anatomical sites of the cervix, vulvar, anal and oral cavities among sexually active women in two communities in Ibadan, Nigeria

Specific HPV Genotype	HPV detection (Yes/No)	Women with the same HPV genotype in all the 4 sites (%)	Women with the same HPV genotype in any 3 sites (%)	Women with the same HPV genotype in any 2 sites (%)	Women with HPV genotype in 1 site only (%)
Women with any HPV 16	Yes (n=24)	2/24 (8%)	9/24 (38%)	2/24 (8%)	11 (46%)
	No (n=26)	-	-	-	-
Women with any HPV 18	Yes (n=25)	2/25 (8%)	4 /25(16%)	5 /25(20%)	14 /25(56%)
	No (n=19)	-	-	-	-
Women with any HPV 31	Yes (n=19)	0	5/19 (26%)	5/19 (26%)	9/19 (48%)
	No (n=15)	-	-	-	-
Women with any HPV 33	Yes (n=9)	0	3/9 (33%)	2/9 (22%)	4/9 (45%)
	No (n=8)	-	-	-	-
Women with any HPV 35	Yes (n=36)	1/36 (3%)	14/36 (39%)	9/36 (25%)	12/36 (33%)
	No (n=40)	-	-	-	-
Women with any HPV 39	Yes (n=30)	2/30 (7%)	11/30 (37%)	7/30 (23%)	10/30 (33%)
	No (n=36)	-	-	-	-
Women with any HPV 45	Yes (n=34)	0	12/34 (35%)	9/34 (27%)	13/34 (38%)
	No (n=33)	-	-	-	-
Women with any HPV 51	Yes (n=30)	2/30 (7%)	6/30 (20%)	5/30 (17%)	17/30 (56%)
	No (n=23)	-	-	-	-
Women with any HPV 52	Yes (n=40)	0	9/40 (23%)	10/40 (25%)	21/40 (52%)
	No (n=28)	-	-	-	-
Women with any HPV 56	Yes (n=23)	1/23 (4%)	6/23 (26%)	5/23 (22%)	11/23 (48%)
	No (n=20)	-	-	-	-
Women with any HPV 58	Yes (n=35)	2/35 (6%)	5/35 (14%)	7/35 (20%)	21/35 (60%)
	No (n=23)	-	-	-	-
Women with any HPV 59	Yes (n=25)	2/25 (8%)	10/25 (40%)	4/25 (16%)	9/25 (36%)
	No (n=30	-	-	-	-
Women with any HPV 68	Yes (n=28)	1/28 (4%)	7/28 (25%)	8/28 (28%)	12/28 (43%)
	No (n=25)	-	-	-	-
Women with any HPV 6	Yes (n=43)	2/43 (5%)	13/43 (30%)	8/43 (19%)	20/43 (46%)
	No (n=40)	-	-	-	-
Women with any HPV 11	Yes (n=3)	0	0	2/3 (67%)	1/3 (33%)
	No (n=2)	-	-	-	-
Women with any HPV 26	Yes (n=6)	0	2/6 (33%)	1/6 (17%)	3/6 (50%)
	No (n=5)	-	-	-	-
Women with any HPV 40	Yes (n=28)	2/28 (7%)	9/28 (32%)	5/28 (18%)	12/28 (43%)
	No (n=29)	-	-	-	-
Women with any HPV 42	Yes (n=63)	5/63 (8%)	20/63 (32%)	6/63(9%)	32/63 (51%)
	No (n=61)	-	-		-
Women with any HPV 43	Yes (n=19)	0	9/19 (48%)	5/19 (26%)	5/19 (26%)
	No (n=23)	-	-	-	-

Women with any HPV 44	Yes (n=18)	1/18 (6%)	8 /18(44%)	4/18 (22%)	5/18 (28%)
	No (n=23)	-	-	-	-
Women with any HPV 53	Yes (n=39)	0	9/39 (23%)	8/39 (21%)	22/39 (56%)
	N (n=26)	-	-	-	-
Women with any HPV 54	Yes (n=37)	0	13/37 (35%)	14/37 (38%)	10/37 (27%)
	No (n=40)	-	-	-	-
Women with any HPV 61	Yes (n=15)	0	0	7/15 (47%)	8/15 (53%)
	No (n=7)	-	-	-	-
Women with any HPV 66	Yes (n=37)	1/37 (3%)	10/37 (27%)	9/37 (24%)	17/37 (46%)
	No (n=32)	-	-	-	-
Women with any HPV 69	Yes (n=5)	0	1/5 (20%)	0	4/5 (80%)
	No (n=2)	-	-	-	-
Women with any HPV 70	Yes (n=11)	0	5/11 (45%)	1/11 (9%)	5/11 (45%)
	No (n=11)		-	-	-
Women with any HPV 73	Yes (n=14)	0	8/14 (57%)	2/14 (14%)	4/14 (29%)
	No (n=18)	-	-	-	-
Women with any HPV 82	Yes (n=18)	2/18 (11%)	5/18 (28%)	4/18 (22%)	7/18 (39%)
	No (n=20)	-	-	-	-

1*-Orange *colour *used to highlight HR-HPV genotypes;* ***2*-Sky-blue colour** *used to indicate LR-HPV genotypes.*

Table 4.12: Pattern of HPV concordance by means of anatomical sites among females in Ibadan, Nigeria (n=310)

HPV Classification	Anatomic sites	Frequency	Percentage
Any HPV			
	Cervical, vulvar, anal and oral sites	31/310	10.0
Any HR-HPV			
	Cervical, vulvar, anal and oral sites	19/310	6.1
	Cervical, vulvar and anal sites	90/310	29.0
	Cervical and vulvar sites	116/309	37.5
	Cervical and anal sites	92/310	29.7
	Cervical and oral sites	26/310	8.4
	Oral and anal sites	21/309	6.8
	Oral and vulvar sites	24/310	7.7
	Anal and vulvar sites	104/310	33.5
Any LR-HPV			
	Cervical, vulvar, anal and oral sites	16/310	5.2
	Cervical, vulvar and anal sites	97/310	31.3
	Cervical and vulvar sites	123/305	40.3
	Cervical and anal sites	95/310	30.6
	Cervical and oral sites	16/310	5.2
	Oral and anal sites	19/309	6.1
	Oral and vulvar sites	16/310	5.2
	Anal and vulvar sites	95/310	30.6

4.3.5. Factors associated with oral sexual behaviour

Table 4.13 presents results of the factors associated with oral sexual behaviours among females in the community. For level 1, the unadjusted analyses showed that study sites, age group, highest level of education, ownership of a television and current marital status were associated with reported oral sex; however, after adjusting for possible confounders, none of the level 1 factors was found to be associated with oral sex.

For Level 2 (Table 4.13), the unadjusted analyses showed that a history of ever having had transactional sex, the presence of female genital mutilation, ever drank alcohol and ever having taken illicit drugs were associated with reported oral sex. After adjusting for possible confounders, women with history of transactional sex (p=0.012), female genital mutilation (p=0.019), drinking alcohol (p=0.009) and illicit drug use (p=0.002) were associated with previous report of oral sex.

women who reported ever having had touched each other's genital area by hand with their sexual partner ('mutual masturbation') had 15.5 times the odds (95% CI 2.04-118.3) of

reported oral sex; women who reported having ever used illicit drugs (adjusted OR=3.74; 95% CI 1.30-10.76) and those that had female genital mutilation (aOR=2.22; 95% CI 1.07-4.61) had higher odds of reported oral sex compared to who those who did not.

Table 4.13 –Factors associated with previous report of any oral sex among sexually active women from the general population in two communities in Ibadan, Nigeria (N=310)

Variable	n/N(%)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRPAHICS (Level 1)			
Study site		**p=0.034**	p=0.071
Ibadan North LGA[4]	31/157 (20%)	**1**	1
Akinyele LGA	17/153 (11%)	**0.51(0.27-0.96)**	0.56(0.29-1.06)
Age group, years		**p=0.044**	p=0.081
18-24	16/121 (13%)	**1**	1
25-34	23/101 (23%)	**1.94(0.96-3.91)**	1.85(0.91-3.76)
35-45	9/88 (10%)	**0.75(0.31-1.78)**	0.79(0.33-1.89)
Ethnicity		p=0.247	p=0.726
Yoruba	34/240 (14%)	1	1
Others	14/70 (20%)	1.52(0.76-3.02)	1.15(0.54-2.45)
Religion		p=0.343	p=0.532
Christianity/traditional	25/142 (18%)	1	1
Islam	23/168 (14%)	0.74(0.40-1.38)	0.81(0.42-1.56)
Highest education level		**p=0.072**	p=0.188
None and primary	6/62 (10%)	**1**	1
Secondary	25/176 (14%)	**1.55(0.60-3.96)**	1.51(0.58-3.95)
Any tertiary level	17/72 (24%)	**2.88(1.06-7.86)**	2.44(0.87-6.81)
Quranic education		p=0.625	p=0.789
No	29/197 (15%)	1	1
Yes	19/113 (17%)	1.17(0.62-2.20)	1.09(0.57-2.08)
Occupation		p=0.726	p=0.862
No current paid job[5]	11/54 (20%)	1	1
Unskilled worker	2/18 (11%)	0.49(0.10-2.45)	0.58(0.11-3.03)
Semi-skilled worker	32/218 (15%)	0.67(0.31-1.44)	0.72(0.32-1.62)
Skilled worker	3/20 (15%)	0.69(0.17-2.78)	0.74(0.17-3.42)
Income per month[6]		p=0.775	p=0.632
No income	4/35 (11%)	1	1
1 - 10,000N (1-28USD)	20/126 (16%)	1.46(0.47-4.60)	1.53(0.48-4.89)
10,001 - 20,000N (>28 – 56USD)	12/85 (14%)	1.27(0.38-4.26)	1.13(0.33-3.88)
> 20,000N (> 56USD)	12/64 (19%)	1.79(0.53-6.03)	1.88(0.53-6.65)
Own television		**p=0.012**	p=0.106
No	31/149 (21%)	**1**	1
Yes	17/161 (11%)	**0.45(0.24-0.85)**	0.53(0.25-1.15)
Own radio		p=0.173	p=0.825
No	33/186 (18%)	1	1
Yes	15/124 (12%)	0.64(0.33-1.23)	0.92(0.43-1.97)
Current marital status		**p=0.044**	p=0.171
Single[7]	20/82 (24%)	**1**	1
Married and living as married	26/212 (12%)	**0.43(0.22-0.83)**	0.49(0.23-1.04)

Divorced/Widowed/Separated[7]	2/16 (13%)	**0.44(0.09-2.12)**	0.45(0.09-2.34)
BEHAVIOURAL FACTORS (Level 2)	**n/N(row)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[8]**
Ever had other sexual partners[9]		p=0.123	p=0.842
No	41/277 (15%)	1	1
Yes	6/21 (29%)	2.30(0.84-6.27)	1.14(0.33-3.87)
Ever had transactional sex		**p=0.004**	**p=0.012**
No	40/291 (14%)	**1**	**1**
Yes	8/19 (42%)	**4.56(1.73-12.03)**	**3.93(1.42-10.90**)
Female genital mutilation		**p=0.045**	**p=0.019**
No	16/144 (11%)	**1**	**1**
Yes	32/166 (19%)	**1.91(1.00-3.65)**	**2.18(1.12-4.25)**
Ever drank alcohol		**p=0.001**	**p=0.009**
No	25/226 (11%)	**1**	**1**
Yes	23/84 (27%)	**3.03(1.60-5.72)**	**2.54(1.27-5.05)**
Ever taken any illicit drug[10]		**P<0.001**	**p=0.002**
No	38/288 (13%)	**1**	**1**
Yes	10/22 (45%)	**5.48(2.22-13.56)**	**4.92(1.90-12.77)**
Ever heard of HPV[11]		p=0.409	p=0.433
No	43/287 (15%)	1	1
Yes	5/23 (22%)	1.58(0.56-4.47)	1.66(0.49-5.62)
Ever had HIV test		p=0.355	p=0.278
No	18/135 (13%)	1	1
Yes	30/175 (17%)	1.34(0.71-2.53)	1.46(0.73-2.91)

***1**- p-values were obtained from Wald tests; **2** – p values were obtained from Likelihood Ratio tests; **3**- Level 1 factors were adjusted for age and study site; **4**- LGA – Local government area; **5**– Student, apprentice and no job; **6**–N – Naira- currency of Nigeria; USD –United States Dollar; **7**– Living alone; **8**- Level 2 factors were adjusted for age and study site (core variables from Level 1) and ever had transactional sex, alcohol, illicit drug use and female genital mutation; **9**- Participants that had other sexual partner(s) apart from her main sexual partner (12 participants gave no response and they were treated as missing); **10**- Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria; **11**- Awareness of HPV was defined as ever heard of the infection called human papillomavirus infection (Yes or No); Ever engaged in mutual masturbation and smoking were dropped from the model because of few observations.*

4.4. DISCUSSION

This study reported for the first time the prevalence of HPV infections in four anatomical sites of the cervical, vulvar oral and anal sites at the same time among sexually active women living in peri-urban and urban settings in West Africa. Generally, the prevalence of any HPV, any IARC Class 1, Class 2A, Class 2B and Class 3, any HR and any LR -HPV infections was highest in the vulva, followed by the cervical or anal and oral sites. In addition, multiple HPV genotype infections (≥two HPV types) were most prevalent in the vulvar, followed by the anal, cervix and oral sites. The age specific prevalence pattern of any HPV, any Class 1, Class 2A, Class 2B and Class 3, any HR-HPV and any LR-HPV infections exhibited an inverse relationship; the

highest reported prevalences were among adolescents and young females aged 18-24 years in the four anatomical sites compared with older females Multiple HPV infections in the cervical, vulvar and anal samples also had an inverse relationship with age, with the highest prevalence in adolescents and young adults, but the prevalence of oral HPV infection increases with age group with the highest among women aged 35-45 years. The most common HR-HPV genotypes were HPV-35 in the cervix and vulva, HPV-52 in the anal cavity and HPV-51 in the oral sites. In the four anatomical sites, the most common LR-HPV genotypes was HPV-42. The proportion of concordant HPV specific genotypes across the four anatomical sites was low, although the concordance rate increased when examined by three or two anatomic sites. The concordance proportion of any HR and any LR genotype was highest in the cervix and vulva. The most prevalent concordant specific HR-HPV genotypes were HPVs-16 and 18, whereas the low-risk types were HPVs-42 and 6.

We observed almost double the prevalence of any HPV, HR and LR-HPV cervical infections in this study compared with previous studies in Nigeria. However, the pattern of age-specific prevalences were similar [162, 163, 381]. For example, a community survey two decades ago (1999-2000) among 932 women aged 15 years and above in Idikan, Ibadan, southwest Nigeria, found prevalences of 26.3% for any HPV infection, 18.3% for any HR-HPV and 6.5% for any LR cervical HPV infections among the study population [381]. In 2012, another study conducted in Abuja, central Nigeria among 278 women who were 18 years and above, reported a prevalence of any HPV genotype of 37.0% and any HR genotype of 22.0% in their cervical samples [163]. The relatively high prevalence of cervical HPV infection in the present study may possibly be due to changing sexual behaviours across different generations, and furthermore, that the prevalence appears to be increasing with time. Watson-Jones et al. (2013), also established an unusually high prevalence (74.0%) of HPV infection among 334 sexually active female adolescents and young adults (10-25 years) in Mwanza, Tanzania [398]. Worldwide, the prevalence of cervical HPV in the general population is known to be high during the sexual debut and early adulthood stage and declines with age reaching a plateau by 40 years [7]. However, in Africa, Asia and Oceanian populations, there is typically a second peak of prevalence of cervical HPV infection in women aged 50 years and above [7]. The present study did not observe the second peak for the reason that it did not include females above 45 years of age.

The prevalence of anal HPV infection was lower than the reported prevalence of 67.1% among 173 women (18-69 years) in Brazil [125]. There is a paucity of data on the prevalence of anal HPV infections among women in the general population in SSA. The few studies that reported anal HPV infection were mostly on the key affected populations [74, 122]. A Zimbabwean study (2014-2015) among 88 HIV positive adult women (≥18years) reported the prevalence of any anal HPV infection of 60.3% [122]. In South Africa, one study compared the detection of anal HPV by GeneXpert and Hybrid capture 2 methods in a population of 200 HIV positive women 18 years and above. This particular study ascertained anal HPV detection of 40.8% and 41.8% with GeneXpert and Hybrid capture 2 techniques, respectively [74].

The data on the prevalence of vulvar HPV infection among women in the general population are limited compared to other anogenital sites. Studies that reported on vulvar HPV infections were typically conducted among women that had vulvar lesions and were not representative of general population prevalence estimates of vulvar HPV infections [399, 400]. Of the three studies that presented data on the prevalence of any vulvar HPV infection two (from China and UK) were population studies, while a study from the US was a review of medical records [131-133]. The Chinese study reported the low vulvar HPV prevalence of 13.3% for any HPV and 12.8% for any HR-HPV in vulvar samples of 2,327 adult women (18-55%) in the community [133]. A study in the UK among 3829 women aged 25 years and below reported that 34.6% had any HR vulvar HPV infection [132]. The reported prevalences in these two particular studies were lower than reported in the present study at 51.1%, although the UK study did not report the prevalence of LR types and the Chinese study included older women. The high prevalence of vulvar HPV infection relative to other genital sites had been associated with the hypothesis of viral shedding from infection of contiguous anatomical structures such as the cervix and anus.

The prevalence of any or HR oral HPV infections was lower than for the other three anatomical sites. Oral HPV infections including HR genotypes were higher in this study than some previous studies [26, 45]. Specifically, the prevalence of any HPV and HR-HPV infections were three times higher than the global averages presented in two different systematic reviews that involved 26 studies among females that were 18 years and above in 2018 (any HPV -

5.5%; HR-HPV-2.3%) and 21 studies in 2019 (any HPV-3.8%; HR-HPV-2.6%) among healthy adolescents and adult women [26, 45]. However, in 2016, a study in Austria reported a prevalence of 18.1% on oral HPV infection among 310 adolescent and adult females (18-20 years), which was similar to the findings in this study [401].

HPV-35 was the most common HR genotypes in the cervix and vulva, HPV-52 in the anal and HPV-51 in the oral sites. HPV-42 was the most common LR genotypes in the cervix, vulva, anal and oral sites of our study population. Studies in Nigeria had also reported HPV35 and 42 as the most prevalent for cervical HPV infection [163, 381]. Studies in South Africa, Zimbabwe and Tanzania among women found HPV 16 as the most prevalent HR-HPV in the cervix, oral and anal cavities [74, 122, 402-404]. HPV-16 and -18 that are more associated with persistence and the progression of asymptomatic HPV infection than other HR-HPV infections in the pathogenesis of HPV-associated cancers was relatively low in prevalence in this study [405]. The concordance rate of HPV-16 and -18 was the highest in the four anatomical sites. Detection of HPV-16 and -18 could imply a higher risk of detection of similar genotypes in other genital and oral sites. Although, HPV-16 and -18 are the two most common genotypes associated with cervical cancer globally, the burden of other HR-HPV types is crucial in deciding which HPV vaccine should be adopted, besides other factors like the cost and availability of the vaccine.

Risk factors associated with HPV infection in the four anatomical sites differed; the number of lifetime partner for vaginal sex was a common risk factor for high odds of cervical, vulval and anal HPV infections while the age difference of six years and above between the participants and her first vaginal sex partner compared to those with five years or less was associated with lower odds of vulvar and anal HPV infections; the presence of concurrent cervical HPV infections was commonly associated with high odds of HPV infections in oral, vulvar and anal sites; concurrent vulvar HPV infection was associated with high odds of HPV infections in the cervix and anal sites while concurrent anal HPV infection was associated with high odds of HPV infection in the cervix and vulvar. Cervical HPV infections was also associated with age group with lowest odds among the older age group (35-45 years) relative to the youngest age group (18-24 years). Married women had a lower odds of having vulvar HPV

infections compared to participants that were single. Participants living in the rural/peri-urban community had a lower odds of oral HPV infection compared to those living in urban areas.

All the risk factors associated with cervical, vulvar, anal and oral HPV infection had been previously reported [45, 79, 116, 132, 133, 406]. However, there are a number of other risk factors that were previously reported for specific anatomical sites that were not found to be associated or not considered in the analyses in this study [106, 407]. A meta-analyses of risk factors associated with oral HPV infection in 2018 reported mixed findings on the association between oral sex and risk of oral HPV infection [45]; while specific studies documented a strong association between oral sex and oral HPV, other studies did not[45]. In our study, the prevalence of oral sex was 11.0% and associated risk factors included transactional sex, female genital mutilation, ever drank alcohol and use of illicit drugs. However, none of these practices, including oral sex, was determined to be associated with oral HPV infection. Concomitant cervical HPV infection appeared as a constant risk factor for oral, vulvar and anal HPV infection in this study. In 2019, a meta-analysis of pooled data involving 13,427 women with paired cervical and anal samples showed that cervical and anal HPV infections were highly correlated, particularly in HR-HPV genotype specific infections [408]. Concomitant HPV infection in oral and genital sites may be due to sexual behaviour, autoinoculation or viral shedding with deposition in secretions at another site subsequently being detected as infection in that site. The latter may be particularly substantial regarding the concurrent detection of vulvar and cervical HPV infections.

The odds ratio of an association between an explanatory variable and outcome is a good approximation of a risk ratio (RR) when the prevalence of the outcome is low (≤10%)[409, 410]. However, when the prevalence of the outcome is high (>10%), the odds ratio is not a good approximate of the risk ratio, and this can lead to misinterpretation of results. As prevalence increases, the odds ratio becomes larger than the risk ratio; therefore, if the odds ratio is misinterpreted as the risk ratio, it will be overestimated. This may lead to confusing messages during dissemination of research findings. [409, 411]. In this study, the prevalence of cervical HPV infection was very high among sexually active women from the general

population in two communities in Ibadan, Nigeria. Table 4.14 shows that if the prevalence was low (6%), the OR would have approximated the RR. However, the prevalence of cervical HPV infection was 60% (Table 4.15) - the crude OR was 4.12, and the RR was 1.46 – this could be interpreted as women that gave history of ever taken illicit drugs had 4.12 times the odds of having cervical HPV infection compared to those without illicit drug history. However, the interpretation in form of relative risk will be, the risk of cervical HPV infection was 1.46 times more likely among women that gave a history of ever taken illicit drugs than those without illicit drug history.

Table 4.14: If the HPV prevalence is 6% (N=305)

Ever taken illicit drugs	HPV		Total
	Positive	Negative	
Positive	2	18	20
Negative	16	269	285
Total	18	287	305

OR = 1.87
RR = 1.78

Table 4.15: If the HPV prevalence is 60% (N=305)

Ever taken illicit drugs	HPV		Total
	Positive	Negative	
Positive	17	3	20
Negative	165	120	285
Total	182	123	305

OR = 4.12
RR = 1.46

One solution would be to present a risk ratio or prevalence ratio when the prevalence of an outcome is high. This topic has received attention of researchers in more than a decade. There are four different approaches that has been suggested: two are regression-based methods that directly estimate relative risk (the log-binomial model or Poisson regression with robust standard error)[412]. The other two methods indirectly estimate relative risk from logistic regression by substitution and standardization by estimating the odds ratio. However, these alternative methods have substantial drawbacks that will be presented below[410, 413].

In logistic regression, the model is constrained to estimate the predicted probabilities between zero and one. In a log binomial model, the log risk is always constrained to be less than or equal to zero because the risk is between zero and one[412]. However, when the log binomial model is used, it actually estimates log probabilities since the modelling is done on log scale. This will lead to a problem of failed convergence if the model produces probabilities that are not within the permitted range. For example, log binominal often has problem of failed convergence when the data is sparse. The Poisson regression model is one of the methods used to bypass the problem of data convergence in the log binomial model is used to estimate a risk ratio [410, 412, 413]. Poisson regression involves the log of expected counts and not the log of the probabilities, and it is therefore not constrained to be negative. However, when the data is dispersed or skewed, it usually leads to estimation of unrealistic risks ratio that may be greater than one[412]. The two logistic regression techniques for indirectly obtaining risk ratios from odds ratios generally produce biased estimates and narrowed confidence intervals when substitution method is used while the marginal or conditional standardization methods involves complex steps that may be difficult to interpret[412].

While it is difficult to interpret, statistically, the odds ratio from logistic regression is a robust and valid effect estimate in a cross-sectional study even when the outcome is common. As stated, the issue is the correct interpretation of odds ratios provided that the results are interpreted in terms of the odds instead of reporting it as a risk[409].

There are several potential limitations in this study. First, this study was unable to report on the prevalence of adults older than 45 years which is the period when the second peak prevalence of HPV infections is frequently reported. Second, the exclusion of sexually naïve females could also have accounted for the high prevalence of HPV. Third, the cross-sectional design of the study makes investigation of risk factors for persistence and the clearance of HPV infections impossible. The small observations of particular important explanatory variables did not allow for robust test of association. For example, only one participant reported anal sex. Hence, this practice could not be explored as a potential risk factor of anal HPV infection. The small sample size meant that it was not possible to test for association

between different types of oral sex (given or received) and oral HPV infection. The risk of oral HPV has been reported to be higher in individuals that received oral sex compared to those that give oral sex [45, 414] .

Another source of limitation is the possibility of selection bias, which could compromise the generalisability of the research findings. The original design of the household survey was to select four EAs with probability proportionate to size in each of the two LGAs. After this, house listing would be conducted that involves a census of women (18 to 45 years) residing within the selected EAs. A fixed number of individuals (18-45 years) ought to be selected by simple random sampling from a compiled list of adolescents and young adults (18-25 years) and adults (26-45 years) in each of the selected EAs. However, after the house listing, there was an error. The population of individuals listed from the selected EAs in each LGA were added together and stratified into 18-25 years and 26-45 years, to serve as the sampling frame. This unfortunately makes it impossible to weight the data and to calculate population level estimates for the results of the community survey among the women in the general population.

In conclusion, this study provides a robust estimate of cervical, vulvar, anal and oral HPV prevalence among sexually active females in the general population in Nigeria and demonstrates how prevalent genital HPV infection is in these women. The risk factors for specific HPV infection of different anatomical sites were similar to findings in previous studies. Although HPV infection is transient, the relatively high HPV infection in all anatomical sites relative to previous studies may possibly be due to the changing sexual behaviour and increasing sexual risk practices in the general population, in addition to the study design and the characteristics of study population. The detection of HPV-35 -52 and -51 as the most prevalent HR-HPV types in the genital (cervix and vulva), anal and oral sites, respectively, may suggest the need to consider its coverage as regards the choice of HPV vaccine coverage in Nigeria. However, further studies are required including the design of longitudinal studies that will investigate the persistence of different HR-HPV infections to help policy makers make informed decisions with respect to the evidence-based prevention and management of HPV infection and associated cancers in the country.

CHAPTER 5: EPIDEMIOLOGY OF ORO-GENITAL AND ANAL HUMAN PAPILLOMAVIRUS INFECTIONS AMONG BROTHEL-BASED FEMALE SEX WORKERS IN IBADAN, NIGERIA

5.1. BACKGROUND

Evidence from the literature suggests that FSWs are more vulnerable to STIs than women in the general population due to behavioural, biological and structural risk factors [415, 416]. Worldwide, FSWs are known to engage in sexual risk behaviours including oral and anal sex [415, 417]. In addition, FSWs are occupationally exposed to multiple STIs which potentially increase their risk of acquiring or transmitting new STIs to clients [371, 415, 416]. Risk factors such as legal restriction, stigmatisation, poor organisational protection for commercial sex work and financial incentive for condomless sex with partners worsen their chances of engaging in safe sex [415, 416, 418].

In SSA, FSWs engage in a variety of sexual risk behaviours with both their paying and non-paying clients. According to the systematic review in Chapter 2 of this thesis, 0.3-24.1% of FSWs in Rwanda, Kenya and South Africa had engaged in oral sex, and 2.3-42.8% of FSWs in Rwanda, Cameroun, Kenya, South Africa and Uganda had received anal sex from clients. No studies from Nigeria were identified in this review. In 2019, a meta-analysis of 131 studies involving 74,426 FSWs worldwide reported that anal intercourse prevalence ranged between 0.0 to 84.0% and a pooled estimate for reporting ever practiced anal sex of 15.7% (95% CI, 12.2-19.3) [417]. The review also found a high proportion of condomless anal (46.1%) and vaginal (31.6%) sex among FSWs[417]. Findings from the SHINI qualitative study presented in Chapter 3 of this thesis showed that FSWs participants in the study understood the meaning of oral and anal sexual behaviours and majority of them engaged in both sexual behaviours. Condom use during vaginal sex among FSWs ranged between 20.0-25.0% with the lowest consistent use among brothel-based sex workers [419, 420]. Studies from different localities in Nigeria showed that FSWs had poor negotiation skills for condom use and this lack of skill make them vulnerable to STIs including HPV infections [419-423].

Despite reports of sexual risk behaviours and high-risk of STIs amongst Nigerian FSWs [419, 424], no studies have investigated the association between HPV infections and sexual behaviours in this population. It is important to investigate the burden of HPV infection among FSWs in order to understand the epidemiology of HPV, associated risk factors and potential public health implications for FSW and the community. In addition to Nigeria, there is paucity of data on the prevalence of oral, anal and vulvar HPV among FSWs in the other countries in the West African sub-region. In this chapter, the prevalence of genital (cervical and vulvar), oral and anal HPV infections among brothel-based FSWs will be described, as well as the prevalence of oral and anal sexual behaviours and their association with the prevalence of HPV at these anatomic sites.

5.2. METHODS

5.2.1. Study design

This cross-sectional survey was conducted among brothel-based FSWs as part of the SHINI study in Ibadan. The study involved advocacy, mapping and selection of brothels, sampling of FSWs and enrolment for study participation.

5.2.2. Study setting

This aspect of SHINI study was conducted at different brothel locations in Ibadan. The detailed description of administrative and geographical setting of Ibadan city in Oyo state and Nigeria has been described in Chapter one in this thesis. The brothel survey was conducted in six LGAs in Ibadan: Ibadan North, Northwest, Northeast, Southwest, and Southeast, and Akinyele. Ibadan has high number of brothels compared to other cities in Oyo State. A typical brothel in this part of Nigeria comprises of a building that has rooms occupied by FSWs and also a bar, television-viewing room, dancing room or club. Each brothel has three key officials that constitute a brothel management team: the managing director or director is the owner of the brothel, the manager who coordinates daily activities at the brothel, and a chairlady – the liaison or leader of FSWs. Most FSWs offer a 24-hour service in the brothels; however, the peak working time is at night, weekends, and on public holiday or during festive periods.

5.2.3. Study population

For this study, eligible FSWs were women aged 18 to 45 years, living in a brothel and offering sex in exchange for money or goods [425]. The survey excluded female visitors to the brothel, and FSW that declined to consent or who were pregnant.

5.2.4. Sample size determination

The primary outcomes for this cross-sectional study were the prevalences of genital, oral, and anal HPV infections. Studies of HPV prevalence in Nigeria reported a genital HPV infection prevalence of 10-50% in the female population [163, 381]. Data on oral and anal HPV from Nigeria are lacking; the range of the global prevalence estimates was 3 – 6% [388]. A study in Kenyan FSWs reported a prevalence of genital HPV infection of 56% [426]; estimates of anal and oral HPV infection prevalence in FSWs from Europe are 15% and 7%, respectively [427]. The initial assumption was to sample 120 brothels of 3 FSWs per brothel or 60 brothels of 6 FSWs per brothel from the six LGAs to be able to sample 300 FSWs (i.e. 80% of the total population). The anticipated refusal rate was 2 to 5%. Assuming an alpha of 0.05 and a design effect of 2 owing to the clustered sampling design, a sample size of 300 would be able to estimate a prevalence of 3% with a precision of ± 2.7%. A prevalence of 20% could be estimated with a precision of ± 6.4% and that of 50% with a precision of ± 8.0%.

5.2.6. Study procedures

The summary of the study procedures is shown in figure 5.1.

Training of field staff and advocacy visits

After the recruitment of the field workers, a two-week didactic training including practical sessions were conducted. The training covered an online course on good clinical practice, lectures on clinical research, principles of research ethics, informed consent, and SHINI study procedures. There were sessions on the practical demonstration of face-to-face interview with the SHINI study case report forms. In addition, another one-week training was conducted for the research nurses and this covered how to take a clinical history and examination of the abdomen and pelvis. The clinical training also covered sample collection and syndromic management of STIs using the Nigerian protocol.

After the trainings, the research team including the project manager, female research assistants and two gatekeepers experienced on brothel related public health programme held the formal advocacy meetings with the administrative leadership of the six LGAs, the leadership of the Society Family Health office in Oyo State (http://www.sfhnigeria.org), the state officials of the association of brothel owners and the management team of each selected brothel. Specifically, the SHINI research team discussed the objectives of the study and sought permission to conduct the study from the leadership of the LGAs and brothel owners. These advocacy meetings were led by the project manager and supported by a female supervisor. During the advocacy visit to the SFH office, SHINI team discussed about the existing list of brothels in Ibadan, which the organisation shared with the research team. The list had the name, address and some had the number of FSWs per brothel.

Mapping and selection of brothels

After the advocacy meetings, the project manager, two female members of the SHINI research team (a supervisor and a research assistant) and two gatekeepers met to review the list of brothels from the six LGAs provided by the SFH team. The review included the current operational state of each brothel (functioning or closed), the number of FSWs in each brothel and their location/address. The list of brothels was also reviewed with an Assistant Director in charge of Reproductive Health programme in the Ministry of Health, Oyo State, to ascertain that all brothels were covered.

After the review meetings, the research team comprising of a female research assistant and two gatekeepers conducted the mapping of brothels to confirm the list provided by SFH. This involves a visit to brothel with a checklist to confirm the name of the brothel, address, number of resident FSWs, availability of a room to the study, and safety of the area around the brothels, and to also identify newly established brothels in the locality **(Annex 5.1: List of mapped brothels with number of selected participants).** A second round of visit to individual brothel was conducted by two female research assistants to make a final arrangement and booked a date on the SHINI study calendar to conduct the study.

Sampling of study participants in the brothel

The 28 listed brothels were individually assigned a brothel identification number. Since the total number of the brothels and FSWs was less than the projected estimates, a modified sampling strategy was used to achieve the minimum required sample size. We sampled all FSWs in any brothel that had 10 or less resident sex workers. However, brothels that had 11 or more resident FSWs, 90% of the FSWs were selected by a simple random sampling (***Annex 5.1: List of mapped brothels with number of selected participants***).

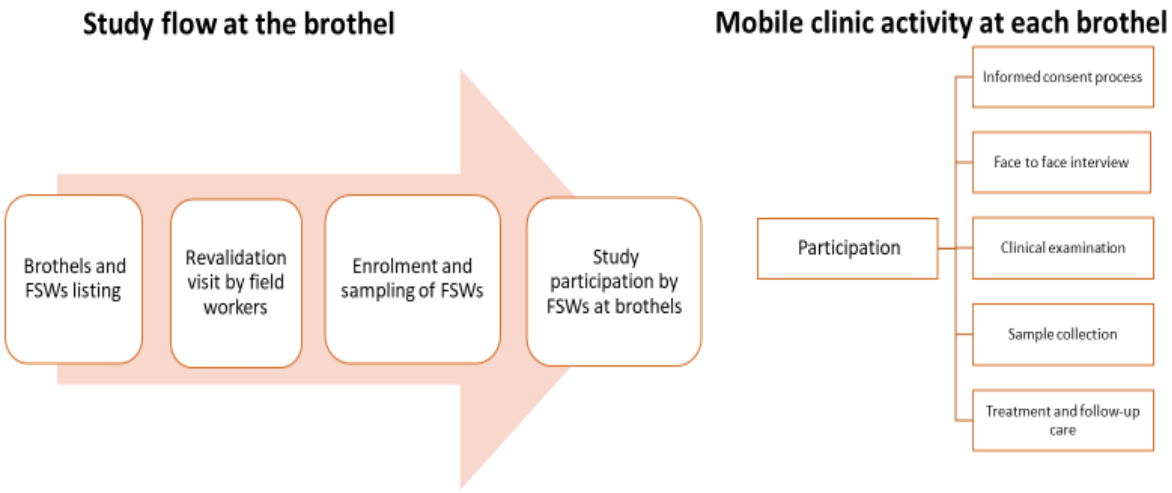
Participant enrolment

An enrolment visit calendar was developed based on agreed dates with the management and participants at each brothel. During the enrolment visit, the female research assistant explained the objectives of the study to selected potential participants as a group in a prepared meeting room that accommodated everyone. After the short meeting, all FSWs that were present at the meeting were also given a copy of information leaflets to read (***Annex 4.2: Information leaflet)***. Potential participants that indicated interest in the study had further discussion with a female research assistant in their individual room after ensuring there were eligible.

After the discussion, potential participant that indicated interest to participate in the study was asked to sign a written informed consent or witnessed consent (if illiterate). The consent covered understanding the research objective, participation including samples collection and HIV counselling and testing, storage of samples for future studies, and dissemination of the results. A witnessed consent was obtained for participants that were not literate. The research assistant explained the study in the presence of a literate third party chosen by the prospective participant. After the participant agreed to participate, the witness signed and dated the consent form. Potential participants that could not write placed a witnessed thumb print over the signature section of the consent form.

FSWs that declined or who were not seen at the brothel after two visits in a week by the research team were excluded from the study.

Figure 5.1: summary of the study procedure in the community



Interview, clinical examination, sample collection and follow-up

The female research assistants and nurses conducted the research at the selected brothels. The research team was supported by the project manager (IMB) and a gatekeeper.

Consenting participants had a face-to-face interview, clinical examination, sample collection and follow-up. All the activities took place inside the bed-room of the individual participant with their consent.

Face to face interview

The interview was conducted by a female research assistant. The interview covered information on socio-demographics, sexual behaviours (including oral and anal sex) and hygiene practices, intravaginal practices, alcohol, smoking/stimulant use, history of sex work and current symptoms of STI/HIV ***(Annex 4.3: Female Case Report Form and annex 5.2: additional questions for FSW)***. Information on history of HPV vaccination was not collected from the participants because the vaccine has not been introduced as part of routine immunisation and it is not universally available in Nigeria. However, information on the awareness of HPV vaccination was collected. Participants were asked questions about different sexual behaviours and each of these behaviours were clearly defined. The interview was conducted in English or pidgin English. The research nurse always took the medical history aspect of the interview after the research assistant had concluded her own interview.

Rapid HIV counselling and testing

After a face-to-face interview, a female nurse obtained consent for HIV counselling and testing with "opt-out" for individual participants if they did not wish to know their HIV status. 5 ml venous blood was drawn into a sample bottle for serial rapid diagnostic HIV tests (RDT). The RDT involves testing of sample blood with Alere Determine™ HIV-1/2 (Alere Medical Co. Ltd, Matsudo-shi, Chiba-ken, Japan). Participants found to be positive in relation to the Determine RDT kit had a further HIV test with Uni-Gold™ HIV-1/2 (Trinity Biotech Manufacturing Ltd; Ireland) RDT. Discordant results between Determine and Uni-Gold RDT were further tested with HIV 1/2 Stat-pak® (Chembio Diagnostic System, Inc. Medford, New York, USA) as a "tie-breaker" test to determine the final result.

This testing algorithm followed the National Guidelines for HIV Prevention Treatment and Care, Federal Ministry of Health, Nigeria[173, 391]. An anonymous RDT was performed on participants that declined to know their HIV result. They were not given their results (***Annex 4.2: RDT HIV serial testing***).

Clinical examination and sample collection

One female research nurse took the medical history and conducted clinical examinations and collected samples from specified anatomic sites (oral cavity, anal cavity, cervix and vulva).

Two samples each were collected from the oral cavity, cervix, vulvar and anal cavities of each female participant. A set of four samples collected was shipped to ICO, Spain for HPV DNA analysis, while the other set of four samples was stored in a freezer as a back-up in Nigeria. The nurse conducted a clinical examination by inspection before samples were collected.

An oral sample was collected using a 30 second oral rinse and gargle method with 10mls of Scope mouth wash (Procter & Gamble©). A nurse demonstrated the rinse and gargle procedure for individual participant to watch. The participant sample was collected into a 10ml labelled sample bottle and placed immediately into a cold box filled with ice-packs. To collect the vulvar sample, the labia were exposed with the participant in a dorsal position with legs apart. The tip of a Dacron swab was used to rub the introitus on either side of the vaginal orifice without touching the urethral orifice. The cervical sample was then collected by inserting a sterile Cusco speculum into the vagina to expose the cervix. The tip of a new Dacron swab was inserted into the cervical os and gently rotated 360 degrees to avoid trauma

to the cervix and potential bleeding before removing it. An anal sample was collected with the participant in a left lateral position. A Dacron swab was inserted into the anal canal (about 5-6 cm beyond the anal verge) and rotated 360 degrees with gentle pressure around the anal verge before removing it. Each of the samples collected with swabs were placed in separate 2 ml cryotubes that were labelled and barcoded prior to being placed into a cold box filled with ice-pack. Samples stored in the cold box filled with ice-packs were transported every four hours to the SHINI study laboratory at the University College Hospital, Ibadan and immediately stored in a -80^{0}C freezer.

Follow-up care and visit at the clinic

Participants with symptoms and signs of STIs were offered free syndromic STI management and counselled for partner notification and treatment[390]. The HIV rapid test results were given to participants, and a research nurse offered post-test counselling irrespective of outcome. Participants with positive rapid HIV test results were referred and linked to a free service specialist clinic for further counselling, repeat test and treatment based on the Nigerian national HIV protocol [391]. Participants that had other medical complaints were referred to a hospital of their choice. Each participant was given health related incentives such as a bar of medicated soap, toothbrush and paste, and also, a toilet tissue paper, two packs of condoms and also a soft drink and biscuit as refreshments.

5.2.7. Laboratory procedures

Sample transport and storage

All samples collected at the clinics were labelled with unique laboratory identification number barcodes to anonymise participants' information. Samples collected were transferred in cold boxes at 2-8 ^{0}C to the SHINI laboratory at the University College Hospital, Ibadan for daily sorting and storage in a -80^{0}C freezer. After the field work was completed, samples were shipped on dry-ice to the ICO, Barcelona, Spain. The back-up samples were stored at a temperature of -80^{o}C in the freezer of the PI (IMB) in Nigeria.

HPV DNA Sample analysis

HPV genotyping of all samples were performed at the ICO, Spain. HPV genotyping was performed using the Anyplex™ II HPV28 Seegene assay (Seegene, Seoul, South Korea), a validated PCR-based quantitative technique for the detection and genotyping of 28 HPV

types. Anyplex™ II HPV28 detection test distinguishes 28 HPV genotypes, including HR-HPV (HPV -16, -18, -31, -33, -35, -39, -45, -51, -52, -56, -58, -59 and -68), LR-HPV (HPVs -6, -11, -40, -42, -43, -44, -53, -54 and -70) and possibly carcinogenic genotypes (HPV-26, -61, -66, -69, -73 and -82). The details of sample handling, DNA extraction and HPV genotyping with Anyplex™ II HPV28 protocol has been described in detail in the Methods of Chapter 4.

5.2.8. Data management

Data collected from the field were received daily at the SHINI research office for quality checks and stored in a locked metal cabinet. Each brothel and individual participant were assigned unique four-digit numbers to maintain privacy and confidentiality. The unique code was written on all the pages of the case report and laboratory samples forms, reports and administrative reports/forms. The brothel enrolment register that contains personal identifiers (name and address) was locked in a cabinet inside the principal investigator's office to prevent unauthorised access. The log files with participant's name and brothel address did not have participant's identification number. The log files were stored in a separate locked cabinet from other data collection forms. Electronic data were password protected with strict access to staff members involved in data management.

The case report forms data were double entered into the REDCAp software (*Vanderbilt University, Nashville Tennessee, USA*)[394-396] that was hosted on the website of the College of Medicine, University of Ibadan by two trained data entry clerks. After resolving the inconsistences observed by the data manager, the raw data were exported in CSV format and saved. The exported data were imported into STATA 16.0 software for analysis (*Stata 2019. Statistical Software: Release 16. College Station, TX: StataCorp LLC*). Visual checks were performed by IMB and the data manager. Thereafter, frequencies of all variables were generated to check for any error or missingness or implausible responses. Data cleaning was performed by IMB and descriptive tables were generated to further check for any incomplete responses and missing observations.

5.2.9. Statistical Analyses

Participants' socio-demographic information, sexual behaviour factors, social habits, information on sex work and clinical factors were summarised with frequencies and proportions for the categorical variables, and means and standard deviations for the continuous variables (Tables 5.1, 5.2, 5.3 and 5.4). The missing variables were reported in the descriptive analyses but were dropped in the test of associations and multivariable models.

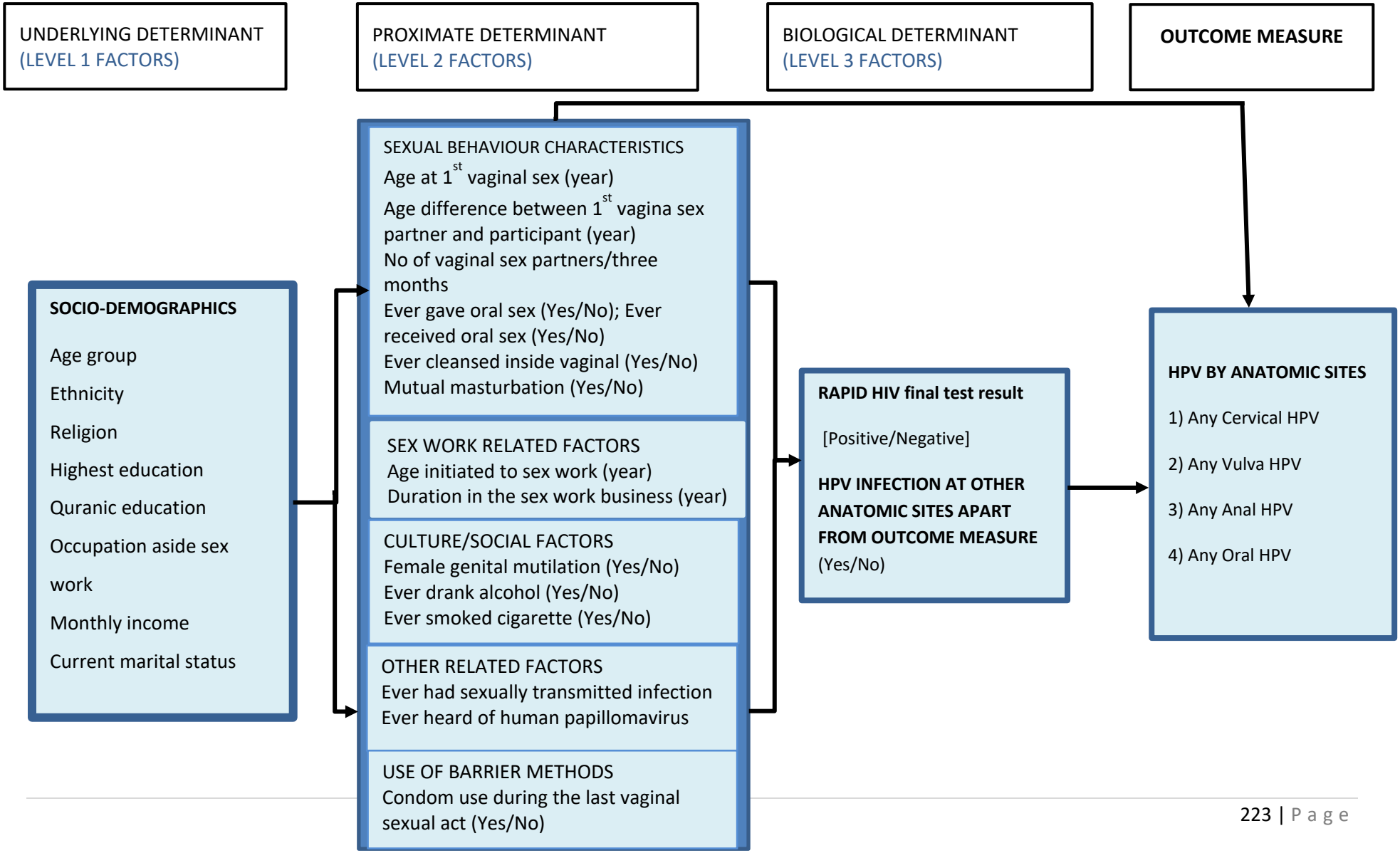
5.2.9.1. Outcome variables

The primary outcome of this study was the prevalence of any HPV infection. The prevalence of HR and LR HPV infection, and according to the 2009 IARC epidemiological oncogenic classification (groups 1, 2a, 2b and 3) for each of the anatomic sites were also calculated with their 95% confidence intervals. Associations between individual classification of HPV and the age group of participants were tested using the one-way ANOVA. Bartlett's test was performed to test whether there were equal variances on variables before conducting a one-way ANOVA. The secondary outcomes were the prevalence of different sexual behaviours, but the risk factor analysis was performed on oral sex alone because there were few participants that reported anal sex.

5.2.9.2. Risk factor analysis for HPV Infections

The risk factor analysis for any HPV infection was based on the conceptual framework (Figure 5.2) that was from the review of literature to answer the specific objectives that were set out for this study. The conceptual framework guided the analysis using hierarchical statistical modelling.

Figure 5.2: Conceptual Framework of the risk factor analysis for any HPV infection among female sex workers



The association with any HPV infection was explored to determine independent risk factors for infection. The detection of any HPV infection was treated as a binary outcome; each anatomic site – cervical, vulvar, anal and oral - was analysed separately. Logistic regression was used to obtain unadjusted estimates for the association between any HPV infection and potential risk factors, with a conceptual framework approach of three level factors: sociodemographic (level 1), behavioural (level 2) and biological factors (level 3)[397]. Age was included in the adjusted estimates *a priori*. Level 1 sociodemographic variables included ethnicity, religion, highest educational level, ever had Quranic education, current occupation (other occupation apart from sex work), monthly income (total income that participant make in a month) and current marital status. Each variable was added one by one to a model that included age. P-values were obtained by likelihood ratio tests. Any variable that met a p value cut off of ≤ 0.1 was included in the adjusted model. All level 1 variables were adjusted.

Level 2 behavioural variables included age at first vaginal sex, age difference between first vaginal sex partner and the participant, number of vaginal sex partners in the past three months, condom use during last vaginal sex, ever gave oral sex, ever received oral sex, age initiated to sex work business, Duration of years in sex work business, ever experienced mutual masturbation, history of female genital mutilation, alcohol use, illicit drug use, ever diagnosed with a sexually transmitted infection and ever heard of the infection called human papillomavirus. The variable measuring ever having cleansed inside the vagina was not included in the regression model because there were no observations. Each level 2 variable was added one by one to a model that included level 1 variables meeting a p value cut off of ≤ 0.1 after adjusting 'core variables'. Any level 2 variable that met a p value cut off of ≤ 0.1 was included with the level 1 core variables in the level 2 adjusted model.

Biological (level 3) variables were RDT final result and laboratory detection of concomitant HPV infection from the other three anatomic sites apart from the outcome measure. For example, if the outcome measure was to determine risk factor for any vulvar HPV, concomitant HPV detection in cervical, anal and oral sites were included as explanatory variables. Each level 3 variable was added one by one to a model that included level 1 'core variables' and level 2 factors that met likelihood ratio p value cut off of ≤ 0.1. This strategy

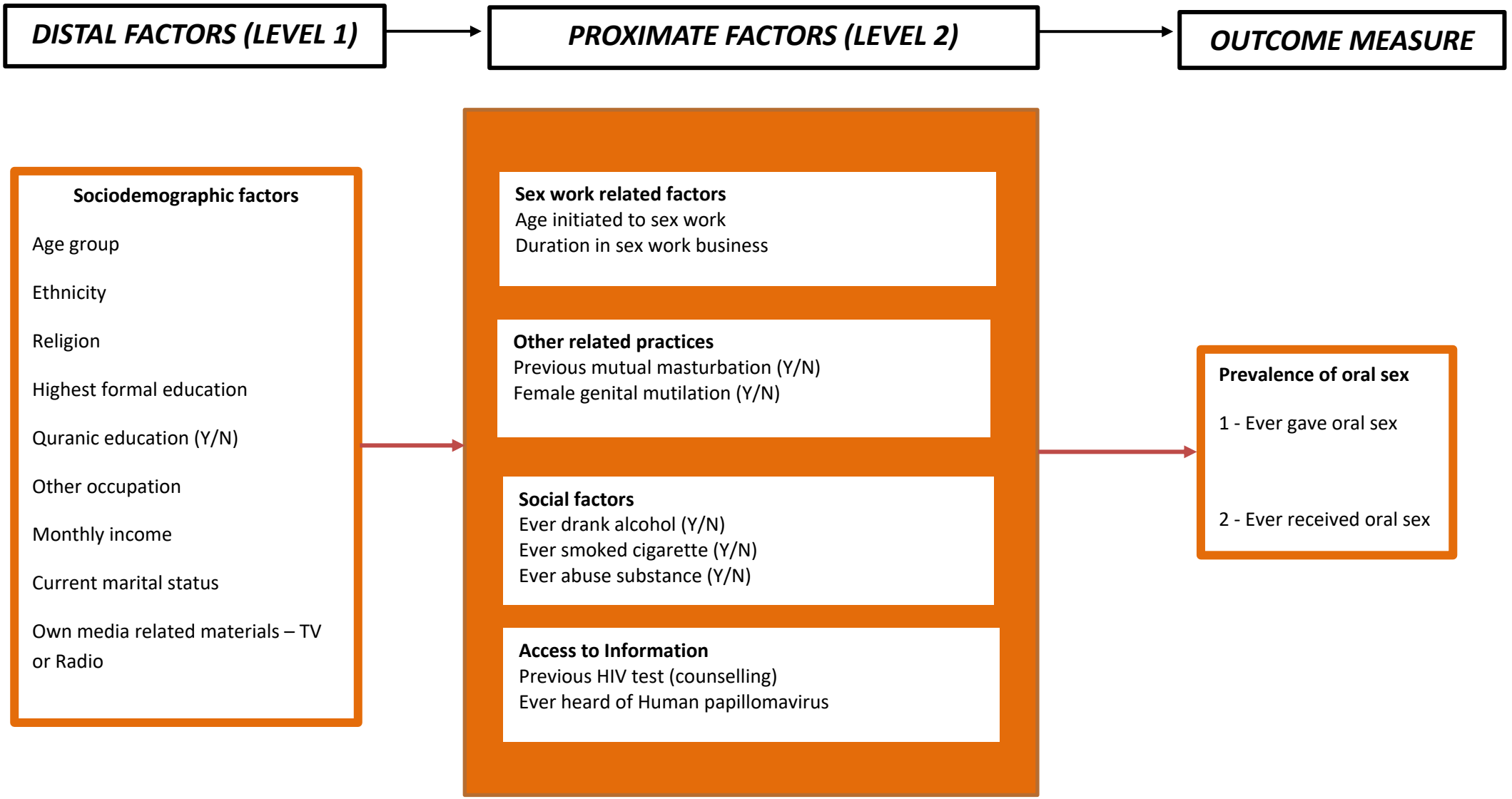
allowed the effects of variables at each level of the framework to be assessed, adjusted for more distal variables.

The concordance of HPV between anatomic sites (oral, cervical, vulvar and anal samples) in individual study participants was defined as the presence of the same type of virus across the four sites. The proportion of concordance for specific HPV type was calculated as the number of each HPV type in all the four sites, any of three and any of two anatomical sites. In addition, the concordance of specific HPV genotype was calculated for each of the anatomical sites and the concordance between ano-genital sites only, cervix and vulva only, cervix and anal sites only, cervix and oral sites only, vulva and anal sites only, oral and anal sites, as well as oral and vulva sites only.

5.2.9.3. Risk factor analysis for oral sexual behaviour

The conceptual framework in figure 5.3 was developed to investigate the association of selected individual and behavioural factors as potential risk factors for oral sex among the FSWs. This conceptual framework was based on an assumption that report of oral sexual practice (given or received) by a FSW with a male sexual partner could be influenced by both her individual and proximate factors. The conceptual framework guided the statistical modelling.

Figure 5.3: Conceptual Framework of the risk factor analysis for oral sex among female sex workers



The proportion of the brothel-based FSWs that ever gave and received oral sex were treated as a separate binary outcome measures for this analysis. Separate logistic regression models were used to obtain crude estimates for the association between each category of oral sexual behaviour (giving and receiving) and potential risk factors. Adjusted estimates were obtained for each category of oral sexual behaviour using a hierarchical approach. Age was included in the adjusted estimates a *priori*. Level 1 sociodemographic variables included ethnicity, religion, highest educational level, other occupation apart from sex work, ever had quranic education, monthly income, owned a television and radio, and current marital status. Each variable was added one by one to a model that included age. P-values were obtained by likelihood ratio tests. Any variable that met a p value cut off of ≤ 0.1 was included in the adjusted model.

All level 1 variables were adjusted and shown in Table 5.15 and 5.16 for giving and receiving oral sex, respectively. Level 2 behavioural variables included the age that the participant was initiated to sex work, duration in sex work business, ever had mutual masturbation, history of female genital mutilation, alcohol use, illicit drug use, awareness of human papillomavirus and ever having been tested for HIV. Each level 2 variable was added one by one to a model that included level 1 variables meeting a p value cut off of ≤ 0.1 after adjusting ('core variables'). Any level 2 variable that met a p value cut off of ≤ 0.1 was included with the level 1 core variables in the level 2 adjusted model. All level 2 variables were adjusted and shown in Tables 5.12 and 5.13.

5.2.5. Ethical considerations

Ethical approvals were obtained from three ethics committees including the London School of Hygiene and Tropical Medicine, London (LSHTM 9736-3), the University of Ibadan/the University College Hospital, Ibadan (UI/EC/16/005), and the Oyo State Government (AD13/479/712) (***Annex 3.5. Ethical approvals***). The consent also covered transportation of biological samples for analysis at ICO Spain.

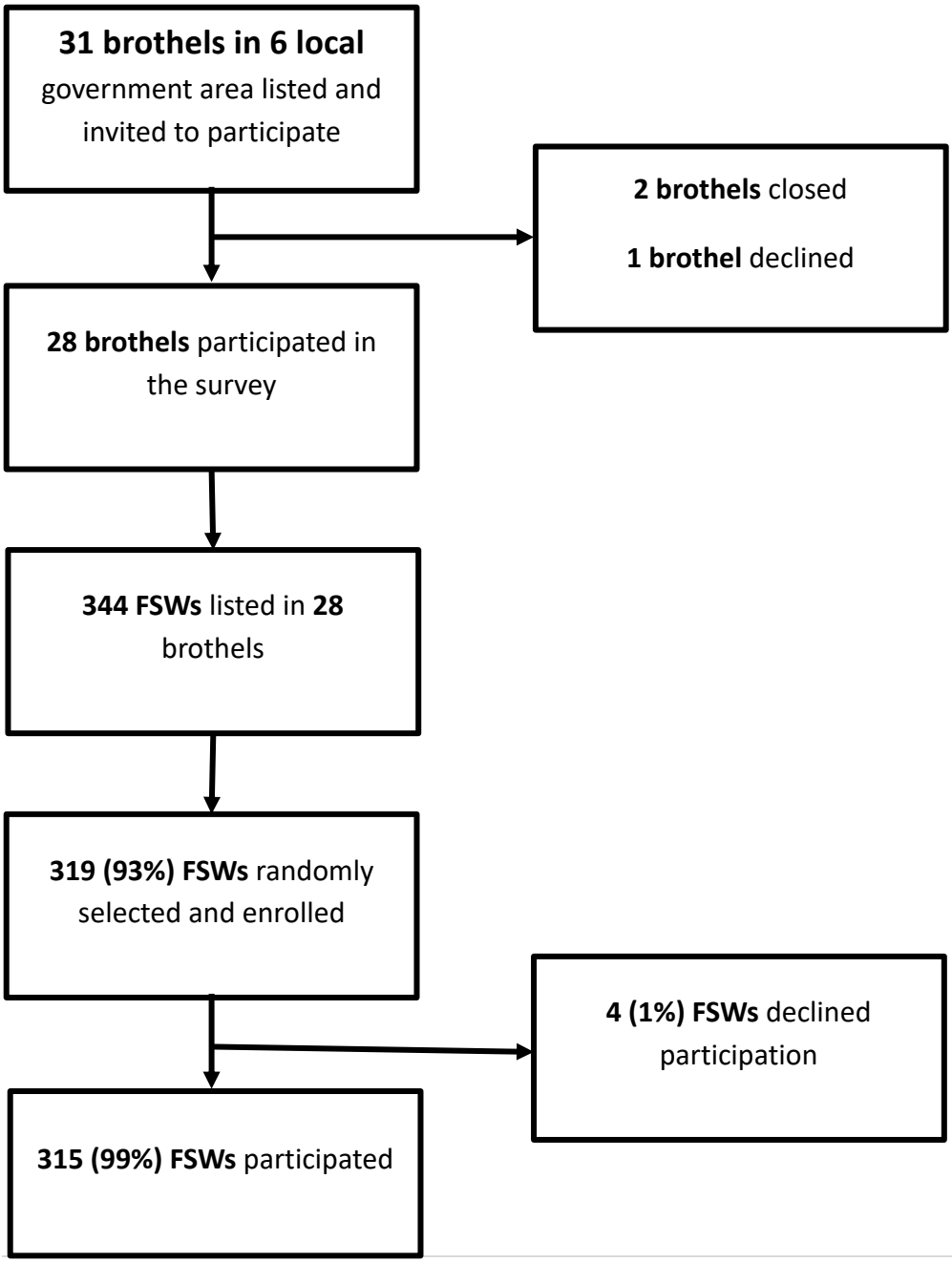
The research team maintained a high ethical standard including confidentiality at every stage of the study procedure.

5.3. RESULTS

5.3.1. Descriptive results of study participants

Out of the 31 brothels listed in six local governments of Ibadan city, two had stopped operating before the study commenced and the management of one of the selected brothels declined participation. Three hundred and forty-four eligible FSWs were listed from the remaining 28 brothels. Of those listed, 319 (93%) FSWs were randomly selected proportional to the brothel size and invited to participate in the study. Three hundred and fifteen FSWs consented and participated and four (1%) declined to partook in the study (Figure 5.4).

Figure 5.4 Brothel-based female sex workers enrolment flow for the survey



The mean age of participants was 30 years (standard deviation, SD=7) and more than half (52%) were 25 to 34 years old. Most were Christians (91%) and had no other job apart from sex work (72%). Most participants did not attend Quranic education (93%). Over two-thirds (62%) of participants were from other ethnic minorities in Nigeria, and more than half (56%) earned between 20,000 Naira and 40,000 Naira (56 – 112USD) a month (Table 5.1.).

Table 5.1: Socio-demographic characteristics of brothel-based female sex workers in Ibadan, Nigeria (N=315)

Variable	Frequency	Percentage
Age, years		
Mean (SD)	30(SD=6.5)	
Age group, years		
18-24	55	17%
25-34	172	55%
36-45	88	28%
Ethnicity		
Yoruba	30	10%
Hausa/Fulani	6	2%
Igbo	83	26%
Others ethnic minorities[1]	196	62%
Religion[2]		
Christianity	286	91%
Islam	27	9%
Highest education level		
No formal education	21	7%
Primary	65	21%
Secondary	201	63%
Tertiary	28	9%
Quranic education		
Yes	21	7%
No	294	93%
Occupation		
No current paid job (e.g. student, apprentice, housewife)	226	72%
Unskilled worker (e.g. office assistant, food vendor)	4	1%
Semi-skilled worker (e.g. driver, caterer, tailor)	82	26%
Skilled worker (e.g. teacher, nurse)	3	1%
Income per month[3]		
≤20,000N (≤56 USD)	37	12%
20,001 - 40,000N (>56 – 112USD)	176	56%
> 40,000N (>112USD)	102	32%
Current marital status		
Single[4]	143	45%
Married and living as married	12	4%
Divorced/Widowed/Separated[4]	160	51%
Items personally owned		
Mobile phone	290	92%

Television	123	39%
Radio	63	20%
Generator	25	14%
House	13	4%

1-*Edo, TIV, Igbira;* ***2-****N=313 – two participants gave no response;* ***3-*** *N – Naira-Nigeria currency; USD –United States Dollar; Living alone*

The mean age of sexual debut of participants was 23.7 years (SD=6.0). The average age of the participants' partners during first vaginal sex was 35 years (SD=7.0). Half of the participants had their vaginal sexual debut at the age of 17 years or less (50%). Most FSWs reported using condoms during their last the vaginal sex (94%). The majority (72%) of participants had between 26-50 vaginal sex partners in the past three months (Table 5.2.)

Sixty-one (19%) FSWs reported ever giving a male partner oral sex. Among these women, the majority first gave oral sex to a male partner between 18-24 years and the mean age was 26 years (SD=7.0). The mean age of the male partner they ever gave oral sex to was 30 years (SD=6.0) among those that knew the age of their partners. Forty-one (71%) reported ever giving oral sex to only one male partner and thirty-six (59%) gave oral sex to one partner in the past three months. About 90% of participants reported giving oral sex to a male sexual partner who did not use a condom. One hundred and thirty-five FSWs (43%) reported ever receiving oral sex from a male partner. The mean age that the participants first received oral sex from a male partner was 27 years (SD=6.0). The average age of the first male partner that the participants received oral sex was 32 years (SD=6.0). Majority had ever received oral sex from a male partner (54%) and a little over a third (39%) had received oral sex in the past three months. Almost all (99%) did not use any barrier methods when receiving oral. Only eight participants (3%) reported receptive heterosexual penile-anal sex.

Most participants reported ever experienced mutual masturbation (97%) with a male partner, while about two third (68%) had practiced self-masturbation. Almost all participants had used their fingers to cleanse inside their vagina (Table 5.2). Three quarter of the participants ever drank alcohol. About a third (32%) had smoked cigarettes and a quarter (24%) had used illicit drugs. The common illicit drugs that participants had ever used include: marijuhana in 47 (61.8%), tramadol in 22 (29%), shisha in 17 (22%) and codeine in 11 (15%).

Table 5.2: Sexual relationships, Partnerships and Behaviours of brothel-based female sex workers in Ibadan, Nigeria (N=315)

Variable	Frequency	Percentage
Currently in a sexual relationship		
Yes	315	100%
No	0	0%
Age of current main sexual partner[1], years		
Mean (SD)	34.5 (6.8)	
Age at first vaginal sex[2], years		
≤ 15	78	26%
16-17	71	24%
≥ 18	153	51%
Age of first vaginal sex partner[3], years		
Mean (SD)	23.7 (6.0)	
Number of partners with vaginal sex in past 3 months[4]		
≤ 25	37	13%
26-50	72	27%
51-75	29	11%
76 - 100	67	25%
> 100	64	24%
Condom use during last vaginal sex		
No	18	6%
Yes	296	94%
Ever gave oral sex to a male partner		
No	254	81%
Yes	61	19%
Age at first ever experience of giving oral sex to a male partner[5] years		
≤ 15	1	2%
16-17	3	5%
18-24	28	48%
≥ 25	26	45%
Age of partner when the first oral sex was given[6,] years		
Mean (SD)	30.4 (6.4)	
Number of lifetime partners given oral sex (N=61)[7]		
1	42	71%
2	8	14%
3	2	3%
≥4	7	12%
Number of partners given oral sex in past 3 months (N=61)		
0	21	34%
1	36	59%
2	2	3%
3	2	3%
Condom use by male partner when oral sex was last given (N=61)		
No	54	89%
Yes	7	11%
Ever received oral sex from a male sexual partner		
No	180	57%
Yes	135	43%

Age at first ever experience of receiving oral sex from a male partner [8], years (N=135)		
≤ 17	2	2%
18-24	44	34%
≥ 25	82	64%
Age of partner when the first oral sex was received, years (N=135)[9]		
Mean (SD)	31.7 (5.8)	
Number of lifetime partners that participant ever received oral sex from (N=135)[10]		
1	68	54%
2	20	16%
3	10	8%
≥4	28	22%
Number of partners that participant received oral sex in past 3 months (N=135)[11]		
0	53	41%
1	51	39%
2	11	8%
3	7	5%
≥4	8	6%
Any barrier method used during the last time oral sex was received (N=135)		
No	133	99%
Yes	2	1%
Ever had anal sex		
No	307	97%
Yes	8	3%
Ever practised mutual masturbation[12]		
No	8	3%
Yes	307	97%
Ever practised self-masturbation		
No	100	32%
Yes	215	68%
Ever cleansed inside vagina[13]		
No	10	3%
Yes	305	97%
Ever drank alcohol		
No	78	25%
Yes	237	75%
Ever smoked cigarettes		
No	214	68%
Yes	101	32%
Ever taken any illicit drug[14]		
No	239	76%
Yes	76	24%

1*-N=192-123 missing;* ***2****-N=267-48 missing;* ***3****-N=302-13 missing;* ***4****-N=269-46 missing;* ***5****-N=59-three missing;* ***6****-N=52-Nine missing;* ***7****-N=59-two missing;* ***8****-N=128-Nine missing;* ***9****-N=128-seven missing;* ***10****-N=126-Nine missing;* ***11****-N=130-five missing;* ***12****- Mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No);* ***13****- Cleansing of vagina was defined as using water or another substance to clean inside of vagina by inserting half or whole finger;* ***14****- Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria*

Only 14 (4%) participants had heard of HPV (Table 5.3). The common sources of information about HPV were through the media (31%), hospital/clinics (15%) and friends (15%) among women who had heard of HPV (Table 5.3). A little over a third (35%) reported a history of STIs. Most (94%) participants had previously tested for HIV infection. Clinical evidence of female genital mutilation was found in 130 (41%) participants. Forty-two (13%) of the participants were HIV positive. The commonest clinical diagnosis that was made at the clinic was pelvic inflammatory disease (10%) and vaginal discharge syndrome (7%).

Table 5. 3: Relevant medical history and clinical and laboratory diagnosis of brothel-based female sex workers in Ibadan, Nigeria (N=315)

Variable	Frequency	Percentage
Ever heard of HPV		
No	301	96%
Yes	14	4%
Sources of information on HPV[1]		
Hospital or clinic	2	15%
Media (TV/Radio/Newspaper/Magazine)	4	31%
Internet	1	8%
Friends/peer	2	15%
Other[2]	4	31%
Ever had a STI		
No	204	65%
Yes	111	35%
Ever tested for HIV infection		
No	20	6%
Yes	295	94%
Female genital mutilation on clinical examination[3]		
No	185	59%
Yes	130	41%
Clinical diagnosis made at the clinic		
Vaginal discharge syndrome	23	7%
Pelvic Inflammatory Disease	31	10%
Genital ulcer disease	3	1%
Genital warts	7	2%
Cervical growth (suspicious of cancer)	5	2%
Rapid diagnosis of HIV at the clinic		
Positive	42	13%
Negative	273	87%

***1**-N=13 – one missing; **2**- **3**- Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No)*

Majority (77%) of participants had been in sex work business for more than a year (Table 5.4). The two most common reasons for engaging in sex work were to obtain money (96%) and lack of job (63%). About a third of participants were patronised by three to four or five to six male clients for commercial sex daily, and majority (35%) reported that 11 to 20 men patronised them for sex weekly. One (11%) in nine participants gave history of ever allowing condomless vaginal sex; 16% had given oral sex and 1% had received oral sex without a barrier method from their fees paying male sex partners. The common reasons participants allowed condomless sex from their commercial sex partners include: lack of money (81%); out of love (39%); to hasten ejaculation (19%) and when under the influence of drugs (17%). Most (85%) participants gave a history of ever convincing their commercial sex partner to use condom.

Table 5.4: Information on sex work history of brothel-based female sex workers in Ibadan, Nigeria (N=315)

Variable	Frequency	Percentage
Years in commercial sex activity		
<1	74	23%
1 - <3	134	43%
3 - <5	59	19%
≥5	48	15%
Reasons for engaging in sex work		
To get money	302	96%
To have fun	5	2%
To have a change of environment	40	13%
Because I have no job	196	63%
Because I lost or separated with my husband	73	23%
To join my friends/colleagues	40	13%
Cajoled/ deceived to join sex work	29	9%
Forced to join sex work	14	4%
Number of men that pay for sex (vagina/oral/anal) daily[1]		
1-2	32	10%
3-4	106	34%
5-6	106	34%
≥7	69	22%
Number of men that pay for sex (vagina/oral/anal) weekly[2]		
1-10	58	19%
11-20	109	35%
20-30	70	22%
≥31	75	24%
Ever allowed vagina sex and the client refused to use condom		
No	279	89%

Yes	36	11%
Ever gave oral sex and the client refused to use condom		
No	264	84%
Yes	51	16%
Ever received anal sex and the client refused to use condom		
	311	99%
No	4	1%
Yes		
Ever had unprotected sex (vaginal/oral/anal) in the last 3 months		
No	279	89%
Yes	36	11%
The last time participant engaged in an unprotected sex		
Today	2	6%
Less than a week ago	14	39%
Within the last 3 months but more than a week	20	55%
Reasons for engaging in unprotected sex with commercial sex partners[3]		
To get more money	29	81%
Cajoled	4	11%
Forced	3	8%
Under the influence of alcohol	1	3%
Under the influence of drug (cocaine)	6	17%
For those that I like or love	14	39%
To hasten ejaculation	7	19%
To avoid sustained erection	6	17%
Commercial partner refused condom	6	17%
Because he is well known	8	22%
Fear of violence from the client	2	6%
Fear of losing the client	2	6%
Any time participant convinced client that initially refused to use condom		
No	46	15%
Yes	269	85%
Any experience of difficulty to negotiate condom use with a client in a new brothel		
No	271	86%
Yes	44	14%

***1**-N=313-two missing; **2**-N=312-three missing; 3- There may be more than one response*

5.3.2. Prevalence of cervical, vulvar, anal and oral HPV Infection

Four biological (cervical, vulvar and anal swabs, and mouthwash) samples were obtained from each of the 315 women. Of the 1260 samples collected, two (0.6%) cervical, four (1.3%) anal swabs, and 33 (10.5%) mouthwash samples were declared as an invalid sample in the laboratory due to the low amount of β globin portion of DNA for the HPV genotyping analysis. These invalid samples were treated as missing in the analysis. The total biological samples analysed were 313 cervical samples, 315 vulvar samples, 311 anal samples and 282 oral samples.

Overall, the prevalence of any detectable HPV among the FSWs was 87.9% (95% CI, 83.8-91.3) in the vulvar samples, 84.0% (95% CI, 79.5-87.9) in the cervical samples, 74.6% (95% CI, 69.4-79.3) in the anal samples and 24.1% (95% CI, 19.2-29.5) in the oral samples (Table 5.5). The prevalence of the any Class 1 (carcinogenic), Class 2A (probable carcinogenic), Class 2B (possible carcinogenic) and Class 3 (unclassified) HPV genotypes by IARC classification was highest in the vulvar samples followed by cervical, anal and oral samples. Furthermore, detection of any HR-HPV and any LR-HPV genotypes was also found to be most prevalent in the vulvar samples, followed by the cervical, anal and oral samples. Any HR-HPV was found in 75.2% (95% CI, 70.1-79.9) of the vulvar samples, 69.3% (95% CI, 63.9-79.8) of the cervical samples, 60.8% (95% CI, 55.1-66.2) of the anal samples and 14.9% (95% CI, 10.9-19.6) of the oral samples of the study participants. There were more multiple HPV genotypes detected in the vulvar samples (70.2% [95% CI, 64.8-75.2]) relative to the cervical (66.3% [95% CI,60.9-71.7]), anal (55.3% [95% CI, 49.6-60.9]) and oral (9.6% [95% CI, 6.4-13.6]) samples.

Generally, there was an inverse relationship between the age of participants and any HPV, HR-HPV, and multiple HPV infections at all anatomic sites. Specifically, there was a significant inverse association between any HPV infection and age of participants in the vulvar and cervical samples. Significant inverse association was also observed between any class 1 and 2A HPV and the age of participants in cervical, vulvar and anal samples. The proportion of any HR-HPV and multiple HPV infection was found to be significantly highest among participants aged 18-24 years and reduced with age in the vulvar, cervical and anal samples. None of the HPV classification considered in this analysis was significantly associated with age in oral samples of the participants of this study (Table 5.5).

Table 5.5: Prevalence of Human papillomavirus infections among 315 brothel-based female sex workers in Ibadan, Nigeria

Variable	Cervical Sample		Vulvar Sample		Anal Sample		Oral Sample	
	n/N[1]	Prevalence (%) [95% CI]	n/N	Prevalence (%) [95% CI]	n/N	Prevalence (%) [95% CI]	n/N	Prevalence (%) [95% CI]
Any HPV genotypes		**p=0.041[2]**		**p=0.001[2]**		p=0.303		p=0.112
18-24 years	51/55	92.7 (82.4-98.0)	54/55	98.2 (90.3-99.9)	48/55	87.3 (75.5-94.7)	16/46	34.8 (21.4-50.2)
25-34 years	145/171	85.0 (78.5-89.8)	154/172	89.5 (84.0-93.7)	125/171	73.1 (65.8-79.6)	37/154	24.0 (17.5-31.6)
35-45years	67/87	77.0 (66.8-85.4)	69/88	78.4 (68.4-86.5)	59/85	69.4 (58.5-79.0)	15/82	18.3 (10.6-28.4)
Overall	263/313	84.0 (79.5-87.9)	277/315	87.9 (83.8-91.3)	232/311	74.6 (69.4-79.3)	68/282	24.1 (19.2-29.5)
HPV classification by IARC[3]								
Class 1 – Carcinogenic[4]		**p=0.041**		**p<0.001[2]**		**p=0.016**		p=0.125
18-24 years	44/55	80.0 (67.0-89.6)	51/55	92.7 (82.4-98.0)	42/55	76.4 (63.0-86.8)	8/46	17.4 (7.8-31.4)
25-34 years	111/171	64.9 (57.3-72.0)	118/172	68.6 (61.1-75.5)	94/171	55.0 (47.2-62.6)	25/154	16.2 (10.8-23.0)
35-45years	52/87	59.8 (48.7-70.1)	55/88	62.5 (51.5-72.6)	48/85	56.5 (45.3-67.2)	6/82	7.3 (2.7-15.2)
Overall	207/313	66.1 (60.6-71.4)	224/315	71.1 (65.8-76.1)	184/311	59.2 (53.5-64.7)	39/282	13.8 (10.0-18.4)
Class 2A – Probable carcinogenic[5]		p=0.407		p=0.396		p=0.122		p=0.351[2]
18-24 years	11/55	20.0 (10.4-33.0)	13/55	23.6 (13.2-37.0)	11/55	20.0 (10.4-33.0)	2/46	4.3 (0.5-14.8)
25-34 years	35/171	20.5 (14.7-27.3)	34/172	19.8 (14.1-26.5)	17/171	9.9 (5.9-15.4)	2/154	1.3 (0.2-4.6)
35-45years	12/87	13.8 (7.3-22.9)	13/88	14.8 (8.1-23.9)	9/85	11.6 (5.1-21.6)	1/82	1.2 (0.03-6.6)
Overall	58/313	18.5 (14.4-23.3)	60/315	19.0 (14.9-23.8)	37/311	10.6 (5.0-19.2)	5/282	1.8 (0.6-4.1)
Class 2B – Possible carcinogenic[6]		**p=0.007**		**p<0.001[2]**		p=0.279		p=0.144
18-24 years	45/55	81.8 (69.1-90.9)	50/55	90.9 (80.0-96.9)	34/55	61.8 (47.7-74.6)	9/46	19.6 (9.4-33.9)
25-34 years	109/171	63.7 (56.1-70.9)	120/172	69.8 (62.3-76.5)	85/171	49.7 (42.0-57.4)	16/154	10.4 (6.1-16.3)
35-45years	49/87	56.3 (45.3-66.9)	50/88	56.8 (45.8-67.3)	43/85	50.6 (39.5-61.6)	7/82	8.5 (3.5-16.8)
Overall	203/313	64.9 (59.3-70.1)	220/315	69.8 (64.4-74.9)	162/311	52.1 (46.4-57.8)	32/282	11.3 (7.9-15.6)
Class 3 – Unclassified[7]		p=0.532		p=0.210[2]		p=0.063[2]		p=0.365[2]
18-24 years	7/55	12.7 (5.3-24.5)	11/55	20.0 (10.4-33.0)	11/55	20.0 (10.4-33.0)	0/46	0
25-34 years	28/171	16.4 (11.2-22.8)	30/172	17.4 (12.1-24.0)	19/171	11.1 (6.8-16.8)	6/154	3.9 (1.4-8.3)
35-45years	10/87	11.5 (5.7-20.1)	9/88	10.2 (4.8-18.5)	6/85	7.1 (2.6-14.7)	2/82	2.4 (0.3-8.5)
Overall	45/313	14.4 (10.7-18.8)	50/315	15.9 (12.0-20.4)	36/311	11.6 (8.2-15.7)	8/282	2.8 (1.2-5.5)

Any HR-HPV genotypes[8]		**p=0.008**		**p<0.001[2]**		**p=0.006**		p=0.143
18-24 years	47/55	85.5 (73.3-93.5)	53/55	96.4 (87.5-99.6)	44/55	80.0 (67.0-89.6)	9/46	19.6 (9.4-33.9)
25-34 years	117/171	68.4 (60.9-75.3)	127/172	73.8 (66.6-80.2)	97/171	56.7 (48.9-64.3)	26/154	16.9 (11.3-23.8)
35-45years	53/87	60.9 (49.9-71.2)	57/88	64.8 (53.9-74.7)	48/85	56.5 (45.3-67.2)	7/82	8.5 (3.5-16.8)
Overall	217/313	69.3 (63.9-74.4)	237/315	75.2 (70.1-79.9)	189/311	60.8 (55.1-66.2)	42/282	14.9 (10.9-19.6)
Any LR-HPV genotype[9]		p=0.005		p<0.001		p=0.241		p=0.409
18-24 years	47/55	85.5 (73.3-93.5)	51/55	92.7 (82.4-98.0)	35/55	63.6 (49.6-76.2)	9/46	19.6 (9.4-33.9)
25-34 years	113/171	66.1 (58.5-73.1)	123/172	71.5 (64.1-78.1)	88/171	51.5 (43.7-59.2)	22/154	14.3 (9.2-20.8)
35-45years	52/87	59.8 (48.7-70.1)	51/88	58.0 (47.0-68.4)	43/85	50.6 (39.5-61.6)	9/82	11.0 (5.1-19.8)
Overall	212/313	67.7 (62.2-72.9)	225/315	71.4 (66.1-76.4)	166/311	53.4 (47.7-59.0)	40/282	14.2 (10.3-18.8)
Multiple HPV genotypes[10]		**p=0.001[2]**		**p<0.001[2]**		**p=0.001**		p=0.330
18-24 years	47/55	85.5 (73.3-93.5)	51/55	92.7 (82.4-98.0)	44/55	80.0 (67.0-89.6)	7/46	15.2 (6.3-28.9)
25-34 years	113/171	66.1 (58.5-73.1)	117/172	68.0 (60.5-74.9)	84/171	49.1 (41.4-56.9)	14/154	9.1 (5.1-14.8)
35-45years	48/87	55.2 (44.1-65.9)	53/88	60.2 (49.2-70.5)	44/85	55.1 (40.7-62.7)	6/82	7.3 (2.7-15.2)
Overall	208/313	66.5 (60.9-71.7)	221/315	70.2 (64.8-75.2)	172/311	55.3 (49.6-60.9)	27/282	9.6 (6.4-13.6)

1**-n/N – number of samples with positive HPV infection as numerator and total samples with valid result as denominator; **2**- Bartlett's test for equal variances were significant (p< 0.05); **3-IARC** – International Agency for Research on Cancer (**- HPV genotypes in IARC classification that are not included in the Anyplex II HPV28 platform); **4- Class 1 IARC HPV** -16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59**; 5- Class 2A IARC HPV** - 68; **6- Class 2B IARC HPV** - 5*, 8*, 26, 30*, 34*, 40, 42, 43, 44, 53, 54, 55*, 61, 66, 67*, 69, 70, 71*, 72*, 73, 81*, 82, 83*, 84*, 85*, 97*, IS39* and CP6108*; **7- Class 3 IARC HPV** - 6, 11; **8- 14 HR-HPV Group** - Class 1 IARC HPV and Class 2A IARC HPV; **9- 14 LR-HPV** - Class 2b IARC and Class 3 IARC; **10-** Multiple HPV infection- Detection of two or more genotypes of HPV by Anyplex II HPV28 from a sample; All invalid samples were excluded from the descriptive analysis*

The graphs in figures 5.5, 5.6, 5.7, 5.8 and 5.9 showed the pattern of HPV specific genotypes for cervical, vulvar, anal and oral samples of participants. The most prevalent HR-HPV genotype detected was HPV-35 in in all four anatomic sites: vulva (20.1% [95% CI, 15.8-25.0]), cervix (19.1% [95% CI,14.9-23.8]), anal cavity (18.2% [95% CI, 10.2-18.2]) and oral cavity (4.3% [95% CI, 1.7-6.4]). The second most common genotypes were HPV-68 in the vulvar (19.1% [95% CI,14.9-23.8]) and cervical (18.5% [95% CI, 14.4-23.3]) samples, HPV-51 in anal (12.5% [95% CI, 9.1-16.7]) and HPV-16 in oral (3.5% [95% CI, 1.7-6.4]) samples. HPV-53 was the most common LR-HPV genotypes detected in the vulvar (23.5% [95% CI, 18.9-28.6]), cervical (21.7% [95% CI, 17.3-26.7]) and anal (16.1% [95% CI, 12.8-21.3]) samples, and HPV-44 in oral (3.9% [95% CI, 2.0-6.9]) samples. The second most common LR-HPV among the participants were HPV-54 in the vulvar (22.2% [95% CI, 17.8-27.2]) and cervical (19.2% [95% CI, 15.0-24.0]) samples, and HPV-42 in the anal (12.9% [95% CI, 9.4-17.1]) and oral (3.2% [95% CI, 1.5-6.0]) samples.

Figure 5.5– Prevalence of specific HPV genotypes according to the four anatomic sites

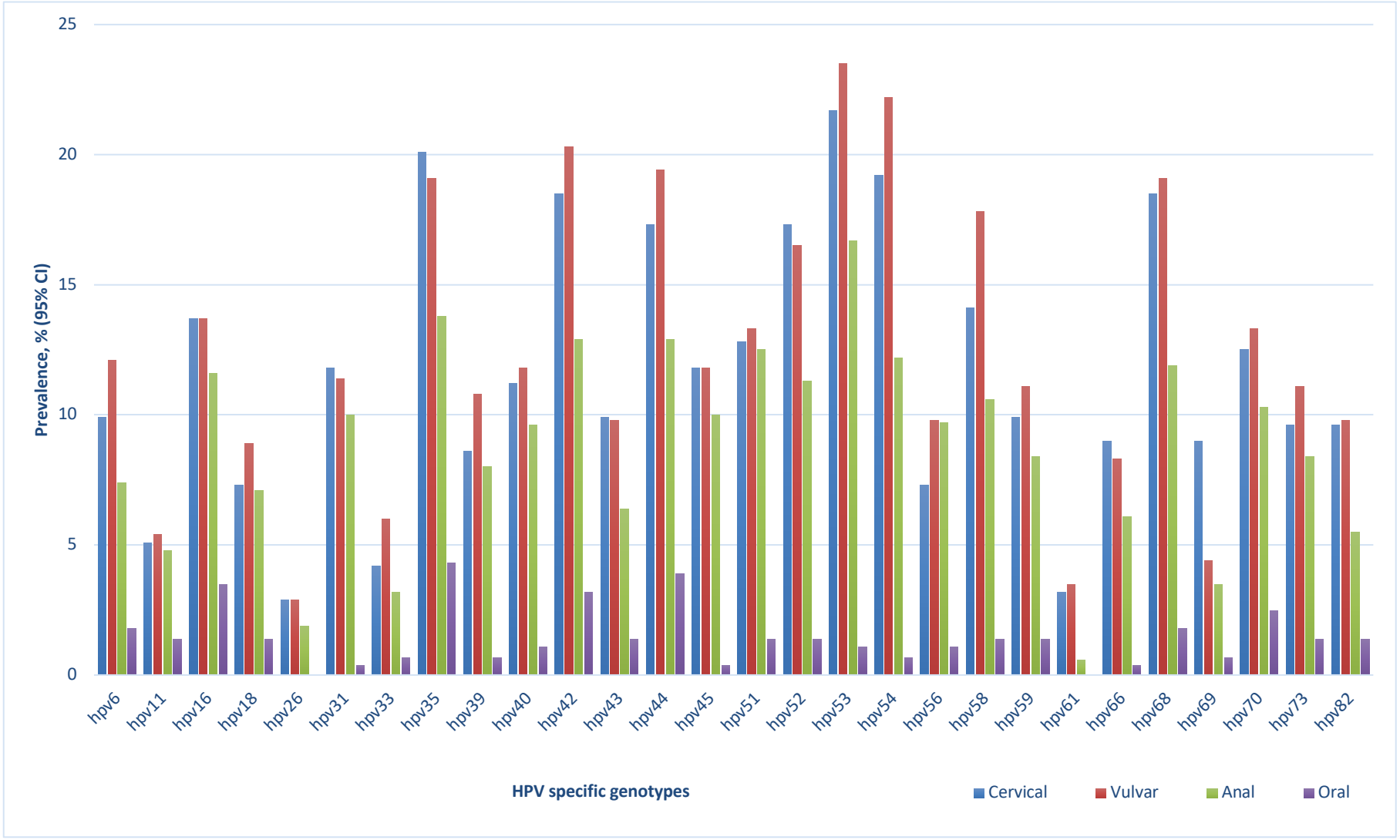
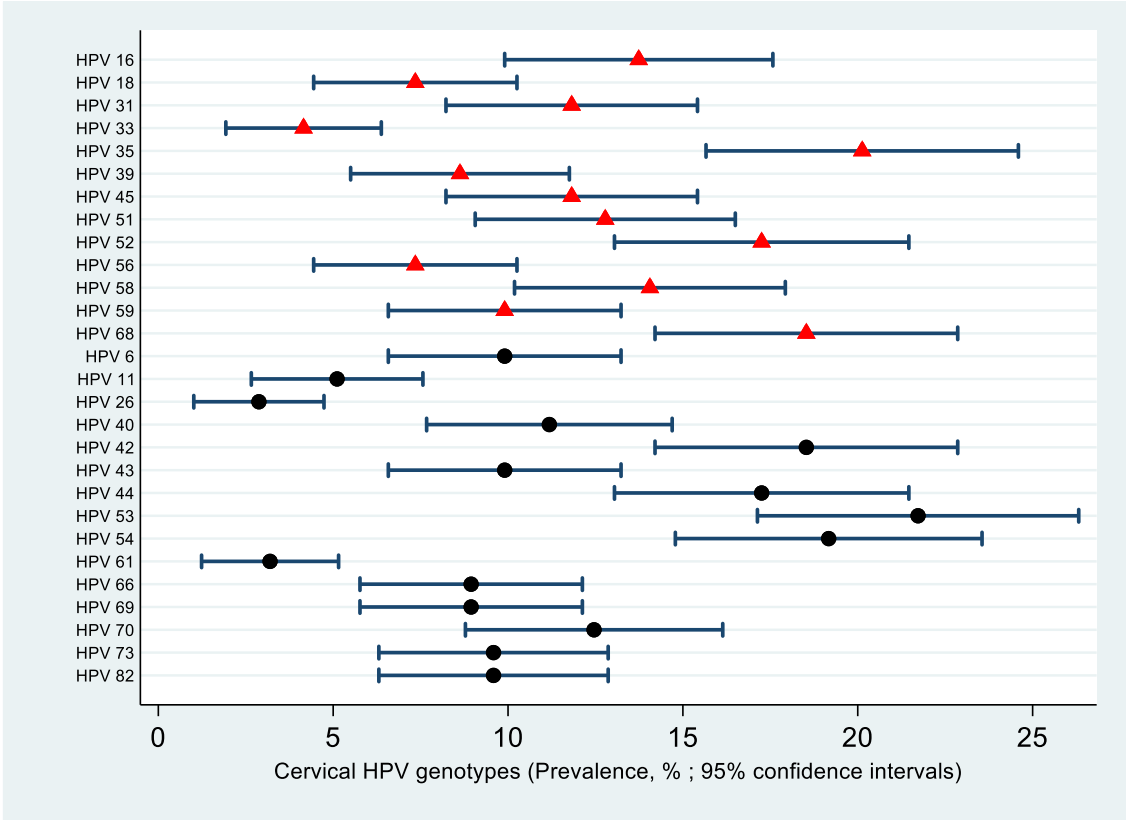
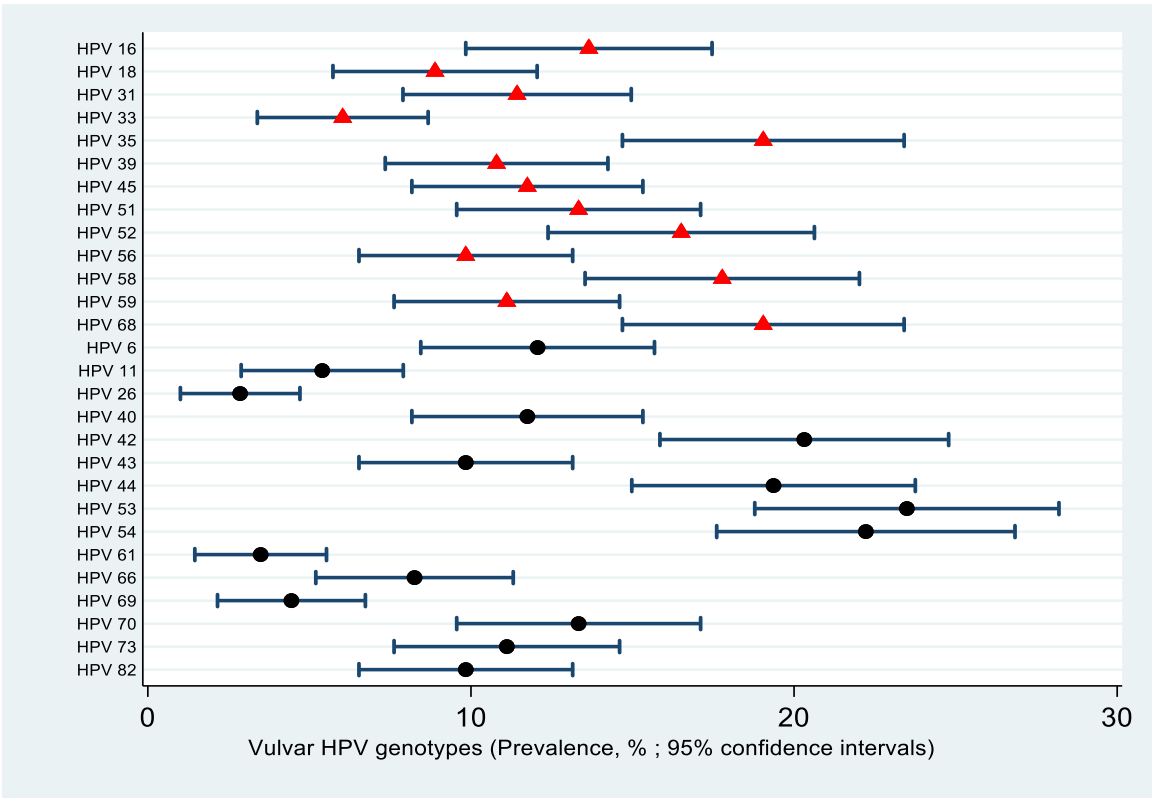


Figure 5.6 – Prevalence of specific cervical HPV genotypes



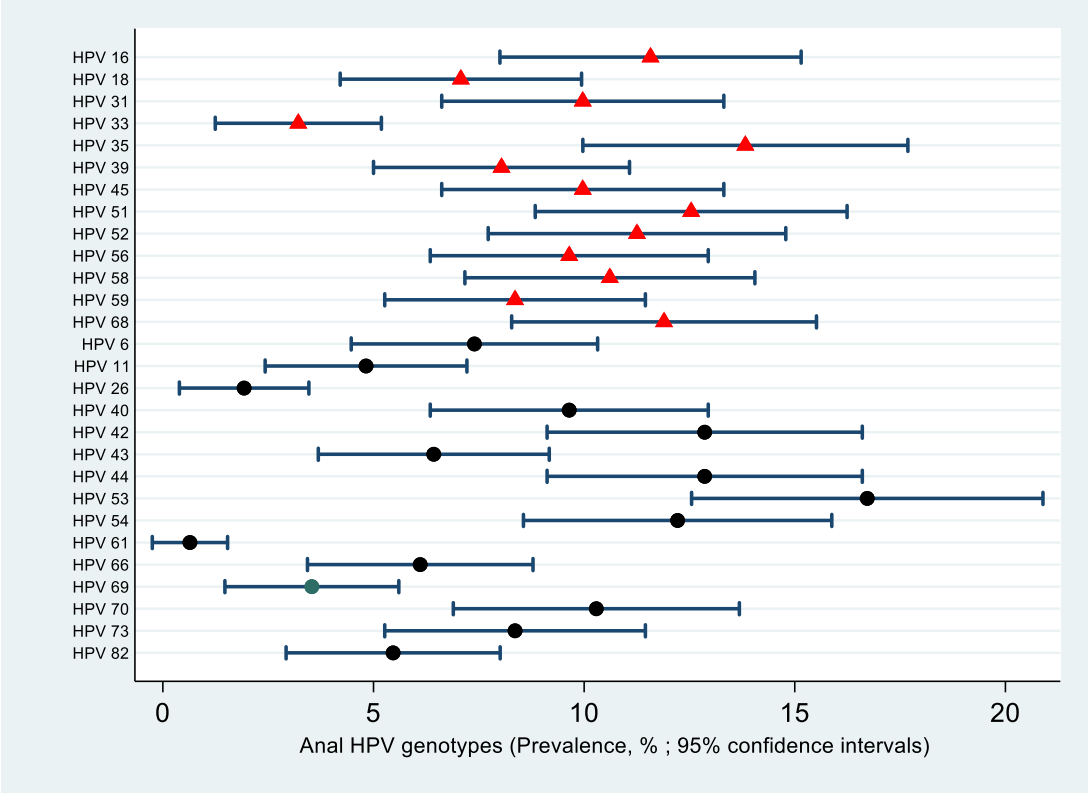
RED triangle indicates HR-HPV point prevalence and **BLACK BALL** indicates LR-HPV point prevalence with lines indicating 95% CI

Figure 5.7 – Prevalence of specific vulvar HPV genotypes



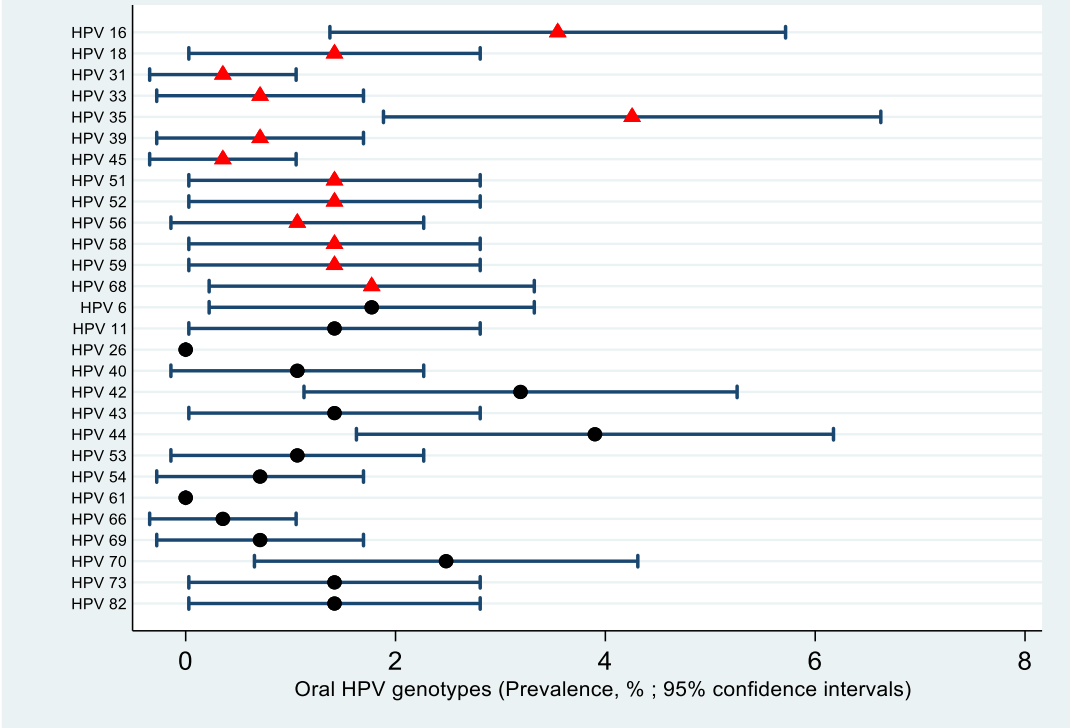
RED triangle indicates HR-HPV point prevalence and **BLACK BALL** indicates LR-HPV point prevalence with lines indicating 95% CI

Figure 5.8– Prevalence of specific anal HPV genotypes



RED triangle indicates HR-HPV point prevalence and **BLACK BALL** indicates LR-HPV point prevalence with lines indicating 95% CI

Figure 5.9– Prevalence of specific oral HPV genotypes



RED triangle indicates HR-HPV point prevalence and **BLACK BALL** indicates LR-HPV point prevalence with lines indicating 95% CI

5.3.3. Risk factors associated with cervical, vulvar, anal and oral HPV Infection

5.3.3. 1. Risk factors associated with cervical HPV Infection

Two hundred and sixty-three (84.0%) FSWs had HPV detected out of 313 valid samples. Table 5.6 shows results of the risk factor analysis for any HPV infection of the cervix. In the regression model, only age group was among the level 1 factors was associated with cervical HPV infection in both unadjusted and adjusted analyses. Participants whose age group were 25-34 years (aOR=0.44, 95% CI, 0.15-1.31) and 35-45 years (aOR=0.26, 95% CI, 0.08-0.82) had lower odds of having cervical HPV infections compared to those that were 18-24 years. For level 2 factors, age initiated into sex work and clinical evidence of female genital mutilation in the participants were the only factor found to be associated with cervical HPV in the unadjusted analyses. After adjusting for confounders, clinical evidence of female genital mutilation still remained associated. There were lower odds (aOR=0.48, 95% CI, 0.26-0.89) of cervical HPV infection in women that had clinical evidence of female genital mutilation than those without.

Being HIV positive and having concomitant vulvar, anal and oral HPV infections were associated with cervical HPV infections in the unadjusted analyses of level 3 factors. After adjusting for confounders, HIV infection and concomitant vulvar HPV infections were still associated with cervical HPV infection. Participants who were HIV positive had 11.39 (95% CI, 1.03-125.83) times the odds of having cervical HPV infection compared to those that were HIV negative, and those with concomitant vulvar HPV infection were 16.60 (95% CI, 5.08-47.54) times the odds of cervical HPV among than those with concomitant vulvar HPV infection.

Table 5.6: Factors associated with cervical human papillomavirus infection among brothel-based female sex workers in Ibadan, Nigeria

Variable	n/N(row %)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHICS FACTORS (Level 1)			
Age group, years		**p=0.035**	**p=0.035**
18-24	51/55 (93%)	**1**	**1**
25-34	145/171 (85%)	**0.44 (0.15-1.31)**	**0.44 (0.15-1.31)**
35-45	67/87 (77%)	**0.26 (0.08-0.82)**	**0.26 (0.08-0.82)**
Ethnicity		p=0.732	p=0.528
Yoruba	25/29 (86%)	1	1
Other[4]	238/284 (84%)	0.83 (0.28-2.49)	0.71 (0.23-2.15)
Religion		p=0.846	p=0.879
Christianity	239/284 (84%)	1	1
Islam and no religion[5]	24/29 (83%)	0.90 (0.33-2.49)	0.93 (0.33-2.58)
Highest education level		p=0.931	p=0.856
No formal education	17/21 (81%)	1	1
Primary	56/65 (86%)	1.46 (0.40-5.36)	1.70 (0.45-6.36)
Secondary	167/199 (84%)	1.23 (0.39-3.89)	1.36 (0.42-4.39)
Tertiary	23/28 (82%)	1.08 (0.25-4.64)	1.14 (0.27-5.00)
Quranic education		p=0.283	p=0.300
No	248/293 (85%)	1	1
Yes	15/20 (75%)	0.54 (0.19-1.57)	0.55 (0.19-1.62)
Other occupation		p=0.407	p=0.473
Student or Apprentice	194/228 (85%)	1	1
Others[6]	69/85 (81%)	0.76 (0.39-1.45)	0.78 (0.40-1.52)
Income per month[7]		p=0.855	p=0.657
≤20,000N (≤56 USD)	83/98 (85%)	1	1
20,001 - 40,000N (>56 – 112USD)	96/113 (85%)	1.02 (0.48-2.17)	0.94 (0.43-2.02)
> 40,000N (>112USD)	84/102 (84%)	0.84 (0.40-1.78)	0.71 (0.33-1.55)
Current marital status		p=0.294	p=0.300
Single[8]	121/140 (86%)	1	1
Ever married [8]	142/173 (82%)	0.72 (0.39-1.34)	0.41 (0.11-1.41)
BEHAVIOURAL FACTORS (Level 2)	**n/N (row %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[9]**
Age at first vaginal sex, years[10]		p=0.601	p=0.702
≤ 15	67/77 (87%)	1	1
16-17	61/71 (86%)	0.91 (0.35-2.34)	0.89 (0.34-2.32)
≥ 18	126/153 (82%)	0.70 (0.32-1.53)	0.73 (0.33-1.61)
Age difference between first vaginal sex partner and participant, years[11]		p=0.134	p=0.345
0	14/21 (67%)	1	1
1-5	119/143 (84%)	2.59 (0.94-7.11)	1.98 (0.68-5.71)
≥ 6	86/100 (86%)	3.07 (1.05-8.94)	2.32 (0.77-7.05)
Number of vaginal sex partners in past three months[12]		p=0.406	p=0.489
1-25	27/36 (75%)	1	1
26-50	62/72 (86%)	2.07 (0.75-5.66)	1.60 (0.56-4.55)
51-75	26/29 (90%)	2.89 (0.70-11.87)	2.46 (0.58-10.43)
76-100	57/66 (86%)	2.11 (0.75-5.92)	1.97 (0.69-5.67)

>100	51/64 (80%)	1.31 (0.50-3.45)	1.05 (0.39-2.87)
Condom use during last vaginal sex[13]		p=0.540	p=0.432
No	16/18 (89%)	1	1
Yes	246/294 (84%)	0.64 (0.14-2.88)	0.56 (0.12-2.61)
Ever gave oral sex to a male sexual partner		p=0.218	p=0.175
No	215/252 (85%)	1	1
Yes	48/61 (79%)	0.64 (0.31-1.29)	0.60 (0.29-1.24)
Ever received oral sex from a male sexual partner		p=0.287	p=0.254
No	153/178 (86%)	1	1
Yes	110/135 (81%)	0.72 (0.39-1.32)	0.70 (0.37-1.30)
Age initiated into sex work, years		**p=0.017**	p=0.825
≤19	21/24 (88%)	1	1
20-24	69/77 (90%)	1.23 (0.30-5.07)	2.12 (0.42-10.54)
25-29	85/100 (85%)	0.81 (0.21-3.06)	2.13 (0.38-12.04)
≥30	88/112 (79%)	0.52 (0.14-1.91)	1.77 (0.29-10.78)
Duration in sex work, years		p=0.539	p=0.814
<1	63/73 (86%)	1	1
1-<3	114/134 (85%)	0.90 (0.40-2.05)	1.00 (0.43-2.31)
3-<5	50/59 (85%)	0.88 (0.33-2.34)	1.18 (0.43-3.25)
≥5	36/47 (77%)	0.52 (0.20-1.34)	0.73 (0.27-1.97)
Ever had mutual masturbation[14]		p=0.507	p=0.636
No	6/8 (75%)	1	1
Yes	257/305 (84%)	1.78 (0.35-9.11)	1.53 (0.28-8.47)
Female genital mutilation[15]		**p=0.011**	**p=0.019**
No	162/183 (89%)	**1**	**1**
Yes	101/130 (78%)	**0.45 (0.24-0.83)**	**0.48 (0.26-0.89)**
Ever drank alcohol		p=0.401	p=0.642
No	67/77 (87%)	1	1
Yes	196/236 (83%)	0.73 (0.35-1.54)	0.84 (0.39-1.80)
Ever smoke cigarettes		p=0.776	p=0.660
No	179/212 (84%)	1	1
Yes	84/101 (83%)	0.91 (0.48-1.73)	0.86 (0.45-1.67)
Ever taken any illicit drug[16]		p=0.759	p=0.406
No	200/237 (85%)	1	1
Yes	63/76 (83%)	0.90 (0.45-1.79)	0.73 (0.36-1.51)
Ever had an STI		p=0.265	p=0.296
No	227/267 (85%)	1	1
Yes	36/46 (78%)	0.63 (0.29-1.38)	0.65 (0.29-1.44)
Ever heard of HPV		p=0.224	p=0.283
No	253/299 (85%)	1	1
Yes	10/24 (71%)	0.45 (0.14-1.51)	0.49 (0.14-1.69)
BIOLOGICAL FACTORS (Level 3)	**n/N(row)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[17]**
RDT HIV final test result		**p=0.003**	**p=0.014**
Negative	224/273 (82%)	**1**	**1**
Positive	39/40 (96%)	**8.53 (1.14-63.60)**	**11.39 (1.03-125.83)**
Vulvar HPV detection		**p<0.001**	**p<0.001**
No	17/38 (45%)	**1**	**1**
Yes	246/275 (89%)	**10.48 (4.97-22.10)**	**16.60 (5.80-47.54)**

Anal HPV detection[18]		**p<0.001**	p=0.281
No	52/79 (66%)	**1**	1
Yes	207/230 (90%)	**4.67 (2.48-8.81)**	1.65 (0.69-3.99)
Oral HPV detection[19]		**p=0.023**	p=0.262
No	174/213 (82%)	**1**	1
Yes	62/67 (93%)	**2.78 (1.05-7.37)**	1.89 (0.59-6.01)

***1**-p-values were obtained from Wald tests; **2** – p values were obtained from Likelihood Ratio tests; **3**- Level 1 factors were adjusted for age; **4**-others – Igbo, Hausa/Fulani and other ethnic minorities; **5**-no religion – one participant said she had no religion; **6**-others-seamstress(tailor), petty trading and teaching; **7**–N – Naira-Nigeria currency; USD –United States Dollar; **8**– Living alone; **9**- Level 2 factors were adjusted for age (core variable from Level 1) and female genital mutilation; **10**-N=301 -12 participants did not provide information on age at first vaginal sex; **11**- N=263 – 50 participants did not provide information to calculate age difference between first vaginal sex partner and participant; **12**-N=267- 46 participants did not provide information on number of vaginal sex partners in past three months; **13**-N=312-one participant did not provide information on condom use during her last vaginal sex; **14**-Mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No); **15**-Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No); **16**-Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria; **17**-Level 3 factors were adjusted for core variable from level 1, female genital mutilation from level 2 and rapid HIV test result, concurrent detection of vulvar HPV infections; **18**-N=309-four participants did not have anal HPV results; **19**-N=280-33 participants did not have oral HPV results*

5.3.3.2. Risk factors associated with vulvar HPV Infection

The results of risk factor analysis for vulvar HPV infection are presented in table 5.7. Out of 315 participants, 277 (88%) had HPV detected in the vulvar samples. The unadjusted analyses of level 1 factors showed that only age group of participants was associated with detection of vulvar HPV infection. After adjusting for confounders, age remained associated with having vulvar HPV infection. The odds of detecting vulvar HPV infection was lower with older age; women aged 25-34 years and 35-45 years had 0.16 (95% CI, 0.02-1.22) times and 0.07 (95% CI, 0.01-0.52) times lower odds of having vulvar HPV infection compared to those aged 18-24 years. Regarding level 2 factors, age difference between first vaginal sex partner and participant and age initiated to sex work business were the only factors associated with vulvar HPV in the unadjusted analyses. After adjusting for confounders, none of the level 2 factors was found to be significantly associated with vulvar HPV infections.

The detection of concomitant any cervical and any anal HPV infections were only Level 3 factors found to be associated with vulvar HPV infection in unadjusted analyses and this association was also retained after adjusting for possible confounders. The odds of detecting vulvar HPV infection was higher among FSWs with concomitant any cervical (aOR=6.48, 95% CI, 2.70-15.57) and any anal (aOR=8.88, 95% CI, 3.66-23.28) HPV infections compared to those with no infections in these anatomical sites.

Table 5.7: Factors associated with vulvar human papillomavirus infection among brothel-based female sex workers in Ibadan, Nigeria

Variable	n/N(row %)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHICS FACTORS (Level 1)			
Age group, years		**p<0.001**	**p<0.001**
18-24	54/55 (98%)	**1**	**1**
25-34	154/172 (90%)	**0.16 (0.02-1.22)**	**0.16 (0.02-1.22)**
35-45	69/88 (78%)	**0.07 (0.01-0.52)**	**0.07 (0.01-0.52)**
Ethnicity		p=0.306	p=0.164
Yoruba	28/30 (93%)	1	1
Others[4]	249/285 (87%)	0.49 (0.11-2.16)	0.39 (0.09-1.73)
Religion		p=0.761	p=0.709
Christianity	251/286 (88%)	1	1
Islam and no religion[5]	26/29 (90%)	1.21 (0.35-4.20)	1.27 (0.36-4.51)
Highest education level		p=0.526	p=0.314
No formal education	17/21 (81%)	1	1
Primary	59/65 (91%)	2.31 (0.58-9.51)	3.15 (0.75-13.28)
Secondary	178/201 (89%)	1.82 (0.56-5.88)	2.27 (0.66-7.74)
Tertiary	23/28 (82%)	1.08 (0.25-4.64)	1.18 (0.26-5.36)
Quranic education		p=0.703	p=0.662
No	258/294 (88%)	1	1
Yes	19/21(90%)	1.33 (0.30-5.93)	1.39 (0.30-6.36)
Other occupation		p=0.533	p=0.603
Student or Apprentice	203/229 (89%)	1	1
Others[6]	74/86 (86%)	0.79 (0.38-1.65)	0.82 (0.39-1.74)
Income per month[7]		p=0.720	p=0.819
≤20,000N (≤56 USD)	85/99 (86%)	1	1
20,001 - 40,000N (>56 – 112USD)	102/114 (89%)	1.40 (0.61-3.19)	1.24 (0.53-2.90)
> 40,000N (>112USD)	90/102 (88%)	1.24 (0.54-2.82)	0.96 (0.41-2.28)
Current marital status		p=0.167	p=0.691
Single[8]	129/141 (91%)	1	1
Ever married	148/174 (85%)	0.53 (0.23-1.09)	0.86 (0.40-1.84)
BEHAVIOURAL FACTORS (Level 2)	**n/N (row %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[9]**
Age at first vaginal sex, years[10]		p=0.561	p=0.338
≤ 15	66/78 (85%)	1	1
16-17	62/71 (87%)	1.25 (0.49-3.18)	1.52 (0.57-4.06)
≥ 18	137/153 (90%)	1.56 (0.70-3.48)	1.89 (0.82-4.36)
Age difference between first vaginal sex partner and participant, years[11]		**p=0.046**	p=0.121
0	15/21 (71%)	**1**	1
1-5	123/143 (86%)	**2.46 (0.85-7.09)**	1.52 (0.50-4.65)
≥ 6	92/100 (92%)	**4.60 (1.40-15.13)**	3.18 (0.92-11.02)
Number of vaginal sex partners in past three months[12]		p=0.861	p=0.566
1-25	32/37 (86%)	1	1
26-50	63/72 (88%)	1.09 (0.34-3.53)	0.79 (0.23-2.70)
51-75	25/29 (86%)	0.98 (0.24-4.02)	0.71 (0.16-3.13)
76-100	62/67 (93%)	1.94 (0.52-7.19)	1.57 (0.41-5.99)
> 100	53/64 (83%)	0.75 (0.24-2.36)	0.60 (0.18-2.02)

Condom use during last vaginal sex[13]		p=0.927	p=0.770
No	16/18 (89%)	1	1
Yes	261/296 (88%)	0.93 (0.21-4.23)	0.79 (0.16-3.87)
Ever gave oral sex to a male sexual partner		p=0.127	p=0.078
No	227/254 (89%)	1	1
Yes	50/61 (82%)	0.54 (0.25-1.16)	0.47 (0.22-1.06)
Ever received oral sex from a male sexual partner		p=0.101	p=0.307
No	163/180 (91%)	1	1
Yes	114/135 (84%)	0.57 (0.29-1.12)	0.68 (0.32-1.43)
Age initiated into sex work, years		**p<0.001**	p=0.171
≤24	97/101 (96%)	**1**	1
25-29	90/100 (90%)	**0.37 (0.11-1.23)**	0.65 (0.17-2.52)
≥30	90/114 (79%)	**0.15 (0.05-0.46)**	0.29 (0.07-1.22)
Duration in sex work, years		p=0.092	p=0.356
<1	67/74 (91%)	1	1
1-<3	122/134 (91%)	1.06 (0.40-2.83)	1.16 (0.43-3.16)
3-<5	46/59 (78%)	0.37 (0.14-1.00)	0.58 (0.21-1.64)
≥5	42/48 (88%)	0.73 (0.23-2.33)	1.35 (3.99-4.60)
Ever had mutual masturbation[14]		p=0.308	p=0.465
No	6/8 (75%)	1	1
Yes	271/307 (88%)	2.51 (0.49-12.91)	2.00 (0.34-11.94)
Female genital mutilation[15]		p=0.911	p=0.777
No	163/185 (88%)	1	1
Yes	114/130 (88%)	0.96 (0.48-1.91)	1.11 (0.54-2.26)
Ever drank alcohol		p=0.321	p=0.728
No	71/78 (91%)	1	1
Yes	206/237 (87%)	0.66 (0.28-1.55)	0.86 (0.35-2.09)
Ever smoked cigarettes		p=0.658	p=0.460
No	187/214 (87%)	1	1
Yes	90/101(89%)	1.18 (0.56-2.49)	1.33 (0.62-2.88)
Ever taken any illicit drug[16]		p=0.632	p=0.923
No	209/239 (87%)	1	1
Yes	68/76 (89%)	1.22 (0.53-2.79)	1.04 (0.44-2.47)
Ever had an STI		p=0.827	p=0.661
No	237/269 (88%)	1	1
Yes	40/46 (87%)	0.90 (0.35-2.29)	0.80 (0.30-2.11)
Ever heard of HPV		p=0.088	p=0.165
No	267/301(89%)	1	1
Yes	10/14 (71%)	0.32 (0.09-1.07)	0.39 (0.11-1.36)
BIOLOGICAL FACTORS (Level 3)	**n/N (row)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**[17]
RDT HIV final test result		p=0.084	p=0.545
Negative	237/273 (87%)	1	1
Positive	40/42 (95%)	3.04 (0.70-13.11)	1.66 (0.30-9.09)
Cervical HPV detection[18]		**p<0.001**	**p<0.001**
No	29/50 (58%)	**1**	**1**
Yes	246/263 (94%)	**10.48 (4.97-22.10)**	**6.48 (2.70-15.57)**
Anal HPV detection[19]		**p<0.001**	**p<0.001**
No	52/79 (66%)	**1**	**1**
Yes	223/232 (96%)	**12.87 (5.71-28.99)**	**8.88 (3.66-23.28)**

Oral HPV detection[20]		p=0.083	p=0.161
No	186/214 (87%)	1	1
Yes	64/68 (94%)	2.41 (0.81-7.13)	2.08 (0.69-6.27)

***1**-p-values were obtained from Wald tests; **2** – p values were obtained from Likelihood Ratio tests; **3**- Level 1 factors were adjusted for age; **4**-others – Igbo, Hausa/Fulani and other ethnic minorities; **5**-no religion – one participant said she had no religion**; 6**-others-seamstress(tailor), petty trading and teaching**; 7**–N – Naira-Nigeria currency; USD –United States Dollar; **8**– Living alone; **9**- Level 2 factors were adjusted for age (core variable from Level 1) and ever given oral sex; **10**-N=302 -13 participants did not provide information on age at first vaginal sex; **11**- N=264 – 51 participants did not provide information to calculate age difference between first vaginal sex partner and participant; **12**-N=269- 46 participants did not provide information on number of vaginal sex partners in past three months; **13**-N=314-one participant did not provide information on condom use during her last vaginal sex; **14**-Mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No); **15**-Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No); **16**-Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria; **17**-Level 3 factors were adjusted for core variable from level 1, ever given oral sex from level 2 and concurrent detection of cervical and anal HPV infections; **18**-N=313-three participants did not have cervical HPV results; **19**-N=311-four participants did not have anal HPV results; **20**-N=282-33 participants did not have oral HPV results*

5.3.3.3. Risk factors associated with anal HPV Infection

Two hundred and thirty-two out of 311 (75 %) FSWs had detectable any anal HPV infection. Table 5.8 shows the multivariable analyses of risk factors associated with anal HPV infection. In the unadjusted analyses of level 1 factors, only age group and monthly income of FSWs was associated with having any anal HPV infection. After adjusting for possible confounders, age group and monthly income remained associated with detection of any anal HPV. The participants whose age were 25-34 years and 36-45 years had 0.39 (95% CI, 00.16-0.93) and 0.37 (95% CI, 0.14-0.93) odds of having any anal HPV infection, respectively, relative to those aged 18-24 years. FSWs that earned between 20,001 to 40,000 Naira and more than 40,000 Naira had 2.07 (95% CI, 1.11-3.86) times and 2.10 (95% CI, 1.09-4.04) times the odds of having any anal HPV infection compared to those that earned less than 20,000 Naira a month. The age difference between first vaginal sex partner and participants was the only level 2 factor associated with detection of any anal HPV in the unadjusted analyses. However, none of the level 2 factors was found to be associated after adjusting for possible confounders. For level 3 factors, the unadjusted analyses showed that the presence of any concomitant cervical or vulvar or oral HPV infections were associated with detection of any anal HPV infection. However, only of the detection of any vulvar HPV infection remained associated with anal HPV infection after adjusting for possible confounders. FSWs that had vulvar HPV infections had higher odds (aOR=10.55, 95% CI, 3.67-30.31) of having any anal HPV infection than those with no vulvar HPV infection.

Table 5.8: Factors associated with anal human papillomavirus infection among brothel-based female sex workers in Ibadan, Nigeria

Variable	n/N (row %)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHICS FACTORS (Level 1)			
Age group, years		**p=0.034**	**p=0.052**
18-24	48/55 (87%)	**1**	**1**
25-34	125/171 (73%)	**0.39 (0.17-0.94)**	**0.39 (0.16-0.93)**
36-45	59/85 (69%)	**0.33 (0.13-0.83)**	**0.37 (0.14-0.93)**
Ethnicity		p=0.228	p=0.080
Yoruba	25/30 (83%)	1	1
Others[4]	207/281 (74%)	0.56 (0.21-1.52)	0.43 (0.15-1.18)
Religion		p=0.532	p=0.557
Christianity	209/282 (74%)	1	1
Islam and no religion[5]	23/29 (79%)	1.34 (0.52-3.42)	1.32 (0.51-3.45)
Highest education level		p=0.593	p=0.514
No formal education	14/21 (67%)	1	1
Primary	51/65 (78%)	1.82 (0.62-5.38)	2.09 (0.68-6.43)
Secondary	146/199 (73%)	1.38 (0.53-3.60)	1.40 (0.52-3.82)
Tertiary	21/26 (81%)	2.10 (0.55-7.96)	1.92 (0.48-7.67)
Quranic education		p=0.476	p=0.445
No	215/290 (74%)	1	1
Yes	17/21 (81%)	1.48 (0.48-4.55)	1.54 (0.49-4.82)
Other occupation		p=0.485	p=0.419
Student or Apprentice	171/226 (76%)	1	1
Others[6]	61/85 (72%)	0.82 (0.47-1.43)	0.78 (0.44-1.41)
Income per month[7]		**p=0.020**	**p=0.030**
≤20,000N (≤56 USD)	63/98 (64%)	**1**	**1**
20,001 - 40,000N (>56 – 112USD)	89/113 (79%)	**2.06 (1.12-3.80)**	**2.07 (1.11-3.86)**
> 40,000N (>112USD)	80/100 (80%)	**2.22 (1.17-4.22)**	**2.10 (1.09-4.04)**
Current marital status		p=0.682	p=0.424
Single[8]	106/14 0(76%)	1	1
Ever married[8]	126/171 (74%)	0.90 (0.54-1.50)	1.26 (0.72-2.22)
BEHAVIOURAL FACTORS (Level 2)	**n/N (row %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[9]**
Age at first vaginal sex, years[10]		p=0.914	p=0.864
≤ 15	56/76 (74%)	1	1
16-17	54/71 (76%)	1.13 (0.54-2.39)	1.15 (0.53-2.48)
≥ 18	115/151 (76%)	1.14 (0.61-2.15)	1.20 (0.62-2.31)
Age difference between first vaginal sex partner and participant, years[11]		**p=0.048**	p=0.134
0	13/21 (62%)	**1**	1
1-5	98/141 (70%)	**1.40 (0.54-3.63)**	0.98 (0.36-2.70)
≥ 6	80/98 (82%)	**2.74 (0.99-7.57)**	1.83 (0.63-5.33)
Number of vaginal sex partners in past three months[12]		p=0.339	p=0.546
1-25	25/36 (69%)	1	1
26-50	50/71 (70%)	1.05 (0.44-2.51)	0.74 (0.29-1.90)
51-75	22/29 (76%)	1.38 (0.46-4.19)	1.06 (0.32-3.48)
76-100	48/67 (72%)	1.11 (0.46-2.70)	0.88 (0.35-2.21)

>100	52/62 (84%)	2.29 (0.86-6.10)	1.59 (0.55-4.61)
Condom use during last vaginal sex[13]		p=0.764	p=0.844
No	14/18 (78%)	1	1
Yes	218/292 (75%)	0.84 (0.27-2.64)	0.89 (0.27-2.91)
Ever gave oral sex to a male sexual partner		p=0.680	p=0.845
No	186/251 (74%)	1	1
Yes	46/60 (77%)	1.15 (0.59-2.23)	1.07 (0.54-2.15)
Ever received oral sex from a male sexual partner		p=0.504	p=0.468
No	131/179 (73%)	1	1
Yes	101/132 (77%)	1.19 (0.71-2.01)	1.22 (0.71-2.10)
Age initiated into sex work, years		p=0.248	p=0.175
≤19	20/24 (83%)	1	1
20-24	58/77 (75%)	0.61 (0.19-2.01)	1.07 (0.28-4.07)
25-29	78/99 (79%)	0.74 (0.23-2.41)	2.39 (0.55-10.33)
≥30	76/111 (68%)	0.43 (0.14-1.37)	1.19 (0.26-5.38)
Duration in sex work, years		p=0.494	p=0.434
<1	59/74 (80%)	1	1
1-<3	103/133 (77%)	0.87 (0.43-1.75)	0.91 (0.44-1.86)
3-<5	36/57 (63%)	0.44 (0.20-0.95)	0.54 (0.24-1.23)
≥5	34/47 (72%)	0.66 (0.28-1.56)	0.73 (0.30-1.81)
Ever had mutual masturbation[14]		p=0.445	p=0.483
No	5/8 (63%)	1	1
Yes	227/303 (75%)	1.79 (0.42-7.68)	1.76 (0.37-8.32)
Female genital mutilation[15]		p=0.168	p=0.327
No	141/182 (77%)	1	1
Yes	91/129 (71%)	0.70 (0.42-1.16)	0.77 (0.45-1.30)
Ever drank alcohol		p=0.343	p=0.446
No	55/78 (71%)	1	1
Yes	177/233 (76%)	1.32 (0.75-2.34)	1.27 (0.69-2.35)
Ever smoked cigarettes		p=0.375	p=0.412
No	155/212 (73%)	1	1
Yes	77/99 (78%)	1.29 (0.73-2.26)	1.28 (0.71-2.33)
Ever taken any illicit drug[16]		p=0.310	p=0.697
No	172/235 (73%)	1	1
Yes	60/76 (79%)	1.37 (0.74-2.56)	1.14 (0.59-2.17)
Ever had an STI		p=0.873	p=0.883
No	198/266 (74%)	1	1
Yes	34/45(76%)	1.06(0.51-2.21)	1.06 (0.50-2.26)
Ever heard of HPV		p=0.098	p=0.147
No	225/298 (76%)	1	1
Yes	7/13 (54%)	0.38 (0.12-1.16)	0.42 (0.13-1.33)
BIOLOGICAL FACTORS (Level 3)	**n/N (row %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**[17]
RDT HIV final test result		p=0.061	p=0.644
Negative	196/269 (73%)	1	1
Positive	36/42 (86%)	2.23 (0.90-5.52)	1.27 (0.80-4.84)
Cervical HPV detection[18]		**p<0.001**	p=0.151
No	23/50 (46%)	**1**	1
Yes	207/259 (80%)	**4.67 (2.48-8.81)**	1.97 (0.80-4.84)
Vulvar HPV detection		**p<0.001**	**p<0.001**
No	9/36 (25%)	**1**	**1**

Yes	223/275 (81%)	**12.87 (5.71-28.99)**	**10.55 (3.67-30.31)**
Oral HPV detection[19]		**p=0.043**	p=0.206
No	155/211 (73%)	**1**	1
Yes	57/67 (85%)	**2.06 (0.98-4.31)**	1.69 (0.73-3.89)

1*-p-values were obtained from Wald tests;* ***2*** *– p values were obtained from Likelihood Ratio tests;* ***3****- Level 1 factors were adjusted for age and monthly income;* ***4****-others – Igbo, Hausa/Fulani and other ethnic minorities;* ***5****-no religion – one participant said she had no religion****; 6****-others-seamstress(tailor), petty trading and teaching****; 7****–N – Naira-Nigeria currency; USD –United States Dollar;* ***8****– Living alone;* ***9****- Level 2 factors were adjusted for age (core variable from Level 1) and ever heard of human papillomavirus;* ***10****-N=298 -13 participants did not provide information on age at first vaginal sex;* ***11****- N=260 – 51 participants did not provide information to calculate age difference between first vaginal sex partner and participant;* ***12****-N=265- 46 participants did not provide information on number of vaginal sex partners in past three months;* ***13****-N=310-one participant did not provide information on condom use during her last vaginal sex;* ***14****-Mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No);* ***15****-Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No);* ***16****-Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria;* ***17****-Level 3 factors were adjusted for core variable from level 1, and concurrent detection of vulvar HPV infections;* ***18****-N=309-two participants did not have cervical HPV results;* ***19****-N=278-33 participants did not have oral HPV results*

5.3.3.4. Risk factors associated with oral HPV Infection

Of the 282 FSWs with valid oral samples, 68 (24%) had detectable any HPV in the oral samples. None of the level 1 factors was associated with detection of any oral HPV infection in the unadjusted and adjusted analyses (Table 5.9). The only level 2 factor that was associated with any oral HPV in the unadjusted analyses was history of ever having heard of HPV and this factor remained associated after adjusting for possible confounders. The odds of detecting oral HPV was higher among FSWs that had ever heard of HPV (aOR=3.88, 95% CI, 1.19-12.64) compared to those with no information about HPV. In the unadjusted analyses of level 3 factors, being HIV positive and having any concomitant anal and cervical HPV infections were associated with detection of any oral HPV. After adjusting for possible confounders, only being HIV positive remained associated with oral HPV among FSWs. FSWs that were HIV positive had 2.40 (95% CI, 1.12-5.14) times the odds of having any oral HPV infection compared to those that were HIV negative.

Table 5.9: Factors associated with oral human papillomavirus infection among brothel-based female sex workers in Ibadan, Nigeria

Variable	n/N(row %)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHICS FACTORS (Level 1)			
Age group, years		p=0.120	p=0.120
18-24	16/46 (35%)	1	1
25-34	37/154 (24%)	0.59 (0.29-1.21)	0.59 (0.29-1.21)
35-45	15/82 (18%)	0.42 (0.18-0.96)	0.42 (0.18-0.96)
Ethnicity		p=0.644	p=0.831
Yoruba	6/29 (21%)	1	1
Others[4]	62/253 (25%)	1.24 (0.48-3.20)	1.11 (0.43-2.88)
Religion		p=0.908	p=0.928
Christianity	61/254 (24%)	1	1
Islam and no religion[5]	7/28 (25%)	1.05 (0.43-2.60)	1.04 (0.42-2.59)
Highest education level		p=0.242	p=0.534
No formal education	8/19 (42%)	1	1
Primary	13/60 (22%)	0.38 (0.13-1.14)	0.42 (0.14-1.27)
Secondary	39/177 (22%)	0.39 (0.15-1.03)	0.42 (0.16-1.13)
Tertiary	8/26 (31%)	0.61 (0.18-2.10)	0.65 (0.19-2.26)
Quranic education		p=0.649	p=0.640
No	64/262 (24%)	1	1
Yes	4/20 (20%)	0.77 (0.25-2.40)	0.77 (0.25-2.39)
Other occupation		p=0.731	p=0.852
Student or Apprentice	51/207 (25%)	1	1
Others[6]	17/75 (23%)	0.90 (0.48-1.68)	0.94 (0.50-1.78)
Income per month[7]		p=0.588	p=0.515
≤20,000N (≤56 USD)	25/90 (28%)	1	1
20,001 - 40,000N (>56 – 112USD)	21/98 (21%)	0.71 (0.36-1.38)	0.69 (0.35-1.36)
> 40,000N (>112USD)	22/94 (23%)	0.79 (0.41-1.54)	0.73 (0.37-1.44)
Current marital status		p=0.979	p=0.619
Single[8]	31/123 (25%)	1	1
Ever married[8]	37/159 (23%)	0.90 (0.52-1.56)	1.17 (0.63-2.15)
BEHAVIOURAL FACTORS (Level 2)	**n/N (row %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[9]**
Age at first vaginal sex, years[10]		p=0.914	p=0.670
≤ 15	15/70 (21%)	1	1
16-17	16/63 (25%)	1.13 (0.54-2.39)	1.22 (0.54-2.76)
≥ 18	37/137 (27%)	1.14 (0.61-2.15)	1.37 (0.68-2.77)
Age difference between first vaginal sex partner and participant, years[11]		p=0.871	p=0.806
0	5/18 (28%)	1	1
1-5	32/128 (25%)	0.87 (0.29-2.62)	0.68 (0.21-2.17)
≥ 6	25/89 (28%)	1.02(0.33-3.14)	0.74 (0.23-3.)
Number of vaginal sex partners in past three months[12]		p=0.492	p=0.440
1-25	8/33 (24%)	1	1
26-50	9/57 (16%)	0.59 (0.20-1.70)	0.53 (0.17-1.63)
51-75	6/28 (21%)	0.85 (0.26-2.84)	0.89 (0.26-3.10)
76-100	18/63 (29%)	1.25 (0.48-3.28)	1.28 (0.47-3.50)
>100	16/59 (27%)	1.16 (0.44-3.10)	0.96 (0.35-2.69)

Condom use during last vaginal sex[13]		p=0.509	p=0.627
No	5/16 (31%)	1	1
Yes	63/265 (24%)	0.69 (0.23-2.05)	0.79 (0.24-2.36)
Ever gave oral sex to a male sexual partner		p=0.780	p=0.475
No	56/229 (24%)	1	1
Yes	12/53 (23%)	0.90 (0.44-1.84)	0.77 (0.37-1.61)
Ever received oral sex from a male sexual partner		p=0.898	p=0.790
No	40/164 (24%)	1	1
Yes	28/118 (24%)	0.96 (0.55-1.68)	1.09 (0.58-2.02)
Age initiated into sex work, years		p=0.176	p=0.397
≤19	7/23 (30%)	1	1
20-24	18/64 (28%)	0.89 (0.32-2.54)	1.16 (0.38-3.56)
25-29	25/89 (28%)	0.89 (0.33-2.43)	1.47 (0.38-5.68)
≥30	18/106 (17%)	0.47 (0.17-1.30)	0.77 (0.17-3.43)
Duration in sex work, years		p=0.413	p=0.396
<1	12/62 (19%)	1	1
1-<3	33/124 (27%)	1.51 (0.72-3.18)	1.59(0.72-3.48)
3-<5	14/52 (27%)	1.54 (0.64-3.70)	0.99(0.32-3.06)
≥5	9/44 (20%)	1.07 (0.41-2.82)	
Ever had mutual masturbation[14]		p=0.404	p=0.444
No	1/8 (13%)	1	1
Yes	67/274 (24%)	2.27 (0.27-18.75)	2.16 (0.25-18.38)
Female genital mutilation[15]		p=0.407	p=0.452
No	42/162 (26%)	1	1
Yes	26/120 (22%)	0.79 (0.45-1.38)	0.80 (0.45-1.42)
Ever drank alcohol		p=0.719	p=0.722
No	18/70 (26%)	1	1
Yes	50/212 (24%)	0.89 (0.48-1.66)	0.89 (0.47-1.69)
Ever smoked cigarettes		p=0.879	p=0.637
No	47/197 (24%)	1	1
Yes	21/85 (25%)	1.05 (0.58-1.89)	1.16 (0.63-2.13)
Ever taken any illicit drug[16]		p=0.978	p=0.813
No	52/216 (24%)	1	1
Yes	16/66 (24%)	1.01 (0.53-1.92)	0.92 (0.48-1.79)
Ever had an STI		p=0.594	p=0.596
No	57/242(24%)	1	1
Yes	11/40(28%)	1.23 (0.58-2.62)	1.23 (0.57-2.66)
Ever heard of HPV		**p=0.047**	**p=0.029**
No	62/270 (23%)	**1**	**1**
Yes	6/12 (50%)	**3.35 (1.04-10.77)**	**3.88 (1.19-12.64)**
BIOLOGICAL FACTORS (Level 3)	**n/N(row %)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**[17]
RDT HIV final test result		**p=0.011**	**p=0.027**
Negative	52/243 (21%)	**1**	**1**
Positive	16/39 (41%)	**2.56 (1.26-5.19)**	**2.40 (1.12-5.14)**
Vulvar HPV detection		p=0.083	p=0.503
No	4/32 (13%)	1	1
Yes	64/250 (26%)	2.41(0.81-7.13)	1.63 (0.37-7.11)
Anal HPV detection[18]		**p=0.043**	p=0.349
No	10/66 (15%)	**1**	1
Yes	57/212 (27%)	**2.06 (0.98-4.31)**	1.47(0.65-3.34)

Cervical HPV detection[19]		**p=0.023**	p=0.307
No	5/44(11%)	**1**	1
Yes	62/236(26%)	**2.78 (1.05-7.37)**	1.75 (0.57-5.29)

***1**-p-values were obtained from Wald tests; **2** – p values were obtained from Likelihood Ratio tests; **3**- Level 1 factors were adjusted for age; **4**-others – Igbo, Hausa/Fulani and other ethnic minorities; **5**-no religion – one participant said she had no religion**; 6**-others-seamstress(tailor), petty trading and teaching**; 7**–N – Naira-Nigeria currency; USD –United States Dollar; **8**– Living alone; **9**- Level 2 factors were adjusted for age (core variable from Level 1) and number of vaginal sex partners in the past three months and ever heard of human papillomavirus; **10**-N=270 -12 participants did not provide information on age at first vaginal sex; **11**- N=235 – 47 participants did not provide information to calculate age difference between first vaginal sex partner and participant; **12**-N=240- 42 participants did not provide information on number of vaginal sex partners in past three months; **13**-N=281-one participant did not provide information on condom use during her last vaginal sex; **14**-Mutual masturbation question was 'have you or your partner ever touched each other's genital area by hand? (Yes or No); **15**-Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No); **16**-Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria; **17**-Level 3 factors were adjusted for core variable from level 1, ever heard of human papillomavirus from level 2 and rapid HIV test result; **18**-N=278-four participants did not have anal HPV results; **19**-N=280-two participants did not have cervical HPV results*

5.3.4. Concordance of genotype specific HPV infection

Thirty-four FSWs had concordance of individual HR-HPV genotypes in all four anatomic sites (Table 5.10): the commonest genotype was HPV-35 in nine participants followed by HPV-51 in four participants. HPV-16, 52 and 58 ranked third with three participants each. Among 38 FSWs with the concordant LR-HPV genotypes in the four anatomic sites, HPV-42 was the commonest in seven participants, followed by HPV-44 in five, HPV-70 in four and HPV-6/11/40/43 in three participants each. Two hundred and fifty-nine FSWs had concordance of the 13 HR-HPV genotypes in any of three of the four anatomic sites, and HPV-56 and HPV-52 were the commonest found among 19 FSWs and 25 FSWs, respectively. Of the 218 FSWs that had the concordance of LR-HPV genotypes in any of three anatomic sites, HPV-53 was the most specific genotype found among 38 FSWs while the second most common was HPV-42 in 25 FSWs.

On the concordance of HPV genotypes between two anatomic sites of participants (Table 5.11), the concordance of any HR-HPV was highest when cervical and vulvar samples (196/315; 62.2%) were compared, followed by between the anal and vulvar samples (173/315; 54.9%), and cervical and anal samples (157/315; 49.8%). Similarly, the highest concordance of LR-HPV was observed between the cervical and vulvar samples, followed by a similar rate of concordance between the cervical and anal samples (141/315; 44.8%), and

the anal and vulvar samples (141/315; 44.8%). The lowest concordance rate for any LR-HPV genotype was between oral and cervical sites (31/315; 9.8%).

Table 5.10: Proportion of HPV genotype specific concordance samples across the four anatomic sites of cervix, vulvar, anal and oral cavities among brothel-based female sex workers in Ibadan, Nigeria

Specific HPV Genotype	HPV detection (Yes/No)	FSW with the same HPV genotype in all the 4 sites (%)	FSW with the same HPV genotype in any 3 sites (%)	FSW with the same HPV genotype in any 2 sites (%)	FSW with HPV genotype in 1 site only (%)
FSW with any HPV16	Yes (n=72)	3/72 (4%)	18/72 (25%)	15/72 (21%)	36/72 (50%)
	No (n=60)	-	-	-	-
FSW with any HPV 18	Yes (n=39)	2/39 (5%)	11/39 (28%)	10/39 (26%)	16/39 (41%)
	No (n=38)	-	-	-	-
FSW with any HPV 31	Yes (n=50)	1/50 (2%)	23/50 (46%)	6/50 (12%)	20/50 (40%)
	No (n=55)	-	-	-	-
FSW with any HPV 33	Yes (n=20)	2/20 (10%)	5/20 (25%)	8/20 (40%)	5/20 (25%)
	No (n=24)	-	-	-	-
FSW with any HPV 35	Yes (n=85)	9/85 (11%)	22/85 (12.4)	19/85 (10.7)	35/85 (19.7)
	No (n=93)	-	-	-	-
FSW with any HPV 39	Yes (n=40)	2/40 (5%)	17/40 (42%)	8/40 (20%)	13/40 (33%)
	No (n=48)	-	-	-	-
FSW with any HPV 45	Yes (n=54)	0	21/54 (39%)	10/54 (18%)	23/54 (43%)
	No (n=52)	-	-	-	-
FSW with any HPV 51	Yes (n=65)	4/65 (6%)	17/65 (26%)	14/65 (22%)	30/65 (46%)
	No (n=60)	-	-	-	-
FSW with any HPV 52	Yes (n=70)	3/70 (4%)	25/70 (36%)	16/70 (23%)	26/70 (37%)
	No (n=75)	-	-	-	-
FSW with any HPV 56	Yes (n=89)	2/89 (2%)	38/89 (43%)	26/89 (29%)	23/89 (26%)
	No (n=158)	-	-	-	-
FSW with any HPV 58	Yes (n=74)	3/74 (4%)	19/74 (26%)	16/74 (21%)	36/74 (49%)
	No (n=63)	-	-	-	-
FSW with any HPV 59	Yes (n=48)	2/48 (4%)	17/48 (35%)	8/48 (17%)	21/48 (44%)
	No (n=48)	-	-	-	-
FSW with any HPV 68	Yes (n=83)	1/83 (1%)	26/83 (31%)	22/83 (27%)	34/83 (41%)
	No (n=77)	-	-	-	-
FSW with any HPV 6	Yes (n=54)	3/54 (6%)	8/54 (15%)	18/54 (33%)	25/54 (46%)
	No (n=43)	-	-	-	-
FSW with any HPV 11	Yes (n=25)	3/25 (12%)	4/25 (16%)	10/25 (40%)	8/25 (32%)
	No (n=27)	-	-	-	-
FSW with any HPV 26	Yes (n=13)	0	2/13 (15%)	7/13 (54%)	4/13 (31%)
	No (n=11)	-	-	-	-
FSW with any HPV 40	Yes (n=50)	3/50 (6%)	17/50 (34%)	12/50 (24%)	18/50 (36%)
	No (n=55)	-	-	-	-
FSW with any HPV 42	Yes (n=78)	7/78 (9%)	25/78 (32%)	22/78 (28%)	24/78 (31%)
	No (n=93)	-	-	-	-
FSW with any HPV 43	Yes (n=42)	3/42 (7%)	12/42 (29%)	11/42 (26%)	16/42 (38%)

	No (n=44)	-	-	-	-
FSW with any HPV 44	Yes (n=81)	5/81 (6%)	23/81 (28%)	24/81 (30%)	29/81 (36%)
	No (n=85)	-	-	-	-
FSW with any HPV 53	Yes (n=89)	2/89 (2%)	38/89 (43%)	26/89 (29%)	23/89 (26%)
	No (n=108)	-	-	-	-
FSW with any HPV 54	Yes (n=87)	2/87 (2%)	26/87 (30%)	25/87 (29%)	34/87 (39%)
	No (n=83)	-	-	-	-
FSW with any HPV 61	Yes (n=17)	0	1/17 (6%)	4/17 (23%)	12/17 (71%)
	No (n=6)	-	-	-	-
FSW with any HPV 66	Yes (n=37)	1/37 (3%)	11/37 (30%)	12/37 (32%)	13/37 (35%)
	No (n=37)	-	-	-	-
FSW with any HPV 69	Yes (n=33)	2/33 (6%)	7/33 (21%)	2/33 (6%)	22/33 (67%)
	No (n=22)	-	-	-	-
FSW with any HPV 70	Yes (n=57)	4/57 (7%)	20/57 (35%)	11/57 (19%)	22/57 (39%)
	No (n=63)				
FSW with any HPV 73	Yes (n=49)	2/49 (4%)	12/49 (24%)	16/49 (33%)	19/49 (39%)
	No (n=46)	-	-	-	-
FSW with any HPV 82	Yes (n=43)	1/43 (2%)	12/43 (28%)	12/43 (28%)	18/43 (42%)
	No (n=39)	-	-	-	-

1-Orange colour *was used to highlight high-risk genotypes;* ***2-Sky-blue colour*** *was used to indicate low-risk HPV genotypes;*

Table 5.11: Pattern of HPV concordance by anatomic sites among brothel-based female sex workers in Ibadan, Nigeria (n=315)

HPV	Anatomic site	Frequency	Percentage
Any HPV			
	Cervical, vulvar, anal and oral sites	54/315	17.1
Any HR-HPV			
	Cervical, vulvar, anal cavity and oral sites	33/315	10.5
	Cervical, vulvar and anal sites	154/315	48.9
	Cervical and vulvar sites	196/315	62.2
	Cervical and anal sites	157/315	49.8
	Cervical and oral sites	36/315	11.4
	Oral and anal sites	36/315	11.4
	Oral and vulvar sites	36/315	11.4
	Anal and vulvar sites	173/315	54.9
Any LR-HPV			
	Cervical, vulvar, anal and oral sites	30/315	9.5
	Cervical, vulvar and anal sites	141/315	44.8
	Cervical and vulvar sites	212/313	67.7
	Cervical and anal sites	141/315	44.8
	Cervical and oral sites	35/315	11.1
	Oral and anal sites	31/315	9.8
	Oral and vulvar sites	35/315	11.1
	Anal and vulvar sites	141/315	44.8

5.3.5. Risk factors associated with oral sexual behaviours

5.3.5.1. Risk factor analysis of ever having given oral sex (fellatio)

The proportion of FSWs who ever gave oral sex to a male partner was 19% (61/315). Only the monthly income of FSWs among level 1 factors was found to be significantly associated with with report of ever giving oral sex in the unadjusted and adjusted model (Table 5.12). Participants whose monthly income was more than 40,000 Naira had 2.43 (95% CI, 1.20-4.91) odds of reporting ever given oral sex to a male client compared to those that earned 20,000 or less Naira per month. None of the level 2 factors was found to be significantly aassociated with report of ever given oral sex in both unadjusted and adjusted models.

Table 5.12: Factors associated with ever gave oral sex among brothel-based female sex workers in Ibadan (N=315)

VARIABLE	Ever gave oral sex n/N(%)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHIC FACTORS (LEVEL 1)			
Age group (years)		p=0.473	p=0.098
18-24	14/55(25%)	1	1
25-34	31/172(18%)	0.64(0.31-1.32)	0.47(0.24-0.93)
35-45	16/88(18%)	0.65(0.29-1.47)	0.60(0.26-1.36)
Ethnicity		p=0.143	p=0.178
Yoruba	3/30(10%)	1	1
Others	58/285(20%)	2.30(0.67-7.85)	2.22(0.63-7.81)
Religion		p=0.168	p=0.251
Christianity	58/286(20%)	1	1
Islam and No religion[4]	3/29(10%)	0.45(0.13-1.55)	0.50(0.14-1.78)
Highest education level		p=0.081	p=0.069
No formal education	2/21(10%)	1	1
Primary	7/65(11%)	1.15(0.22-6.00)	1.17(0.22-6.17)
Secondary	45/201(22%)	2.74(0.61-12.21)	2.85(0.64-12.77)
Tertiary	7/28(25%)	3.17(0.58-17.15)	3.37(0.62-18.38)
Quranic education		p=0.528	p=0.120
No	58/294(20%)	1	1
Yes	3/21(14%)	0.68(0.19-2.38)	0.58(0.29-1.17)
Other occupation[5]		p=0.389	p=0.120
Student or Apprentice	47/229(21%)	1	1
Others	14/86(16%)	0.75(0.39-1.45)	0.58(0.29-1.18)
Income per month[6]		**p=0.003**	**p=0.005**
≤20,000N (≤56 USD)	15/99(15%)	**1**	**1**
20,001 - 40,000N (>56 – 112USD)	15/114(13%)	**0.85(0.39-1.84)**	**0.86(0.39-1.87)**
> 40,000N (>112USD)	31/102(30%)	**2.45(1.22-4.89)**	**2.43(1.20-4.91)**
Own television		p=0.525	p=0.861

No	35/192(18%)	1	1
Yes	26/123(21%)	1.20(0.68-2.12)	0.94(0.48-1.86)
Own radio		p=0.097	p=0.060
No	44/252(18%)	1	1
Yes	17/63(27%)	1.75(0.92-3.33)	1.91(0.99-3.69)
Current marital status		p=0.056	p=0.154
Single[7]	34/141(24%)	1	1
Ever married[7]	27/174(15%)	0.58(0.33-1.02)	0.63(0.33-1.19)
BEHAVIOURAL AND OTHER FACTORS (LEVEL 2)	**Ever gave oral sex n/N(%)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)[8]**
Age initiated to sex work, years		p=0.060	p=0.287
≤19	7/24(29%)	1	1
20-24	15/77(19%)	0.59(0.21-1.67)	0.75(0.22-2.49)
25-29	22/100(22%)	0.68(0.25-1.86)	1.07(0.25-4.50)
≥30	17/144(15%)	0.43(0.15-1.18)	0.39(0.08-2.01)
Duration in sex work, years		p=0.369	p=0.193
< 1	11/74(15%)	1	1
1-<3	24/134(18%)	1.25(0.57-2.72)	1.22(0.53-2.80)
3-<5	13/59(22%)	1.62(0.67-3.94)	1.89(0.71-5.00)
≥5	13/48(27%)	2.13(0.86-5.25)	2.72(1.00-7.43)
Female genital mutilation[9]		p=0.811	p=0.902
No	35/185(19%)	1	1
Yes	26/130(20%)	1.07(0.61-1.89)	1.04(0.57-1.89)
Ever drank alcohol		p=0.296	p=0.352
No	12/78(15%)	1	1
Yes	49/237(21%)	1.43(0.72-2.86)	1.43(0.66-3.10)
Ever smoked cigarettes		p=0.102	p=0.074
No	36/214(17%)	1	1
Yes	25/101(25%)	1.63(0.91-2.90)	1.76(0.95-3.24)
Ever taken any illicit drug[10]		p=0.086	p=0.445
No	41/239(17%)	1	1
Yes	20/76(26%)	1.72(0.93-3.18)	1.34(0.63-2.85)
Ever heard of HPV		p=0.142	p=0.205
No	56/301(19%)	1	1
Yes	5/14(36%)	2.43(0.78-7.53)	2.25(0.67-7.61)
Ever had HIV test		p=0.523	p=0.712
No	5/20(25%)	1	1
Yes	56/295(19%)	0.70(0.25-2.02)	0.81(0.26-2.48)

__1__-p-values were obtained from Wald tests; __2__ – p values were obtained from Likelihood Ratio tests; __3__- Level 1 factors were adjusted for age, highest educational level, monthly income and ownership of a radio; __4__- No religion – one participant had has no religion; __5__– Other job titles petty trading, seamstress and teaching; __6__–N – Naira-Nigeria currency; USD –United States Dollar; __7__– Living alone; __8__- Level 2 factors were adjusted for age, highest educational level, monthly income and ownership of a radio (core variables from Level 1) and smoked cigarette; __9__- Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No); 11-Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria

5.3.5.2. Risk factor analysis of ever received oral sex (cunnilingus)

The proportion of FSWs that reported ever receiving oral sex from a male partner was 43% (135/135). The unadjusted model for level 1 factors showed that religion, highest level of formal education, quranic education, monthly income, ownership of a television andradio were associated with reports of ever receiving oral sex (Table 5.13). However, after adjusting for possible confounders, only current marital status was found to be associated with report of ever having received oral sex. Participants that were ever married had 0.56 (95% CI, 0.33-0.95) odds of ever receiving oral sex compared to those that were single.

In the level 2 factors, history of alcohol consumption and cigarette smoking and use of illicit drugs were found to be associated with report of ever having received oral sex in the unadjusted analyses. After adjusting for possible confounding, participants with history of illicit drug use had higher odds (aOR=1.91, 95% CI 1.02-3.57) of reporting ever receiving oral sex compared to those with no illicit drug use (Table 5.13).

Table 5.13: Factors associated with ever received oral sex among brothel-based female sex workers in Ibadan (N=315)

VARIABLE	Ever received oral sex n/N(%)	p-value[1] Crude OR (95%CI)	p-value[2] Adjusted OR (95%CI)[3]
SOCIO-DEMOGRAPHIC FACTORS (LEVEL 1)			
Age group, years		p=0.846	p=0.598
18-24	23/55(42%)	1	1
25-34	72/172(42%)	1.00(0.54-1.85)	1.25(0.67-2.33)
35-45	40/88(45%)	1.21(0.63-2.30)	1.47(0.69-3.13)
Ethnicity		p=0.262	p=0.433
Yoruba	10/30(33%)	1	1
Others	125/285(44%)	1.56(0.71-3.45)	0.64(0.21-1.96)
Religion		**p=0.009**	p=0.674
Christianity	129/286(45%)	**1**	1
Islam and No religion[4]	6/29(21%)	**0.32(0.13-0.80)**	0.75(0.20-2.86)
Highest education level		p=0.039	p=0.120
No formal education	9/21(43%)	1	1
Primary	18/65(28%)	0.51(0.18-1.42)	0.37(0.13-1.09)
Secondary	96/201(48%)	1.22(0.49-3.02)	0.77(0.29-2.02)
Tertiary	12/28(43%)	1.00(0.32-3.14)	0.66(0.19-2.25)
Quranic education		**p=0.004**	p=0.123
No	132/294(45%)	**1**	1
Yes	3/21(14%)	**0.20(0.06-0.71)**	0.27(0.05-1.49)
Other occupation[5]		p=0.118	p=0.219
Student or Apprentice	92/229(40%)	1	1
Others	43/86(50%)	1.49(0.90-2.45)	1.42(0.81-2.48)

Income per month[6]		**p=0.041**	p=0.057
≤20,000N (≤56 USD)	39/99(39%)	**1**	1
20,001 - 40,000N (>56 – 112USD)	42/114(37%)	**0.90(0.52-1.56)**	0.82(0.45-1.47)
> 40,000N (>112USD)	54/102(53%)	**1.73(0.99-3.03)**	1.64(0.89-3.01)
Own television		**p=0.009**	p=0.092
No	71/192(37%)	**1**	1
Yes	64/123(52%)	**1.85(1.17-2.93)**	1.59(0.93-2.73)
Own radio		**p=0.047**	p=0.238
No	101/252(40%)	**1**	1
Yes	34/63(54%)	**1.75(1.01-3.06)**	1.49(0.77-2.91)
Current marital status		p=0.082	**p=0.031**
Single[7]	70/141(50%)	1	**1**
Ever married[7]	65/174(37%)	0.60(0.39-0.95)	**0.56(0.33-0.95)**
BEHAVIOURAL AND OTHER FACTORS (LEVEL 2)			**Adjusted OR (95%CI)**[8]
Age initiated into sex work, year		p=0.945	p=0.122
≤19	7/24(29%)	1	1
20-24	35/77(45%)	2.02(0.75-5.44)	2.68(0.87-8.26)
25-29	46/100(46%)	2.07(0.79-5.42)	3.46(0.94-12.75)
≥30	47/114(41%)	1.70(0.65-4.43)	1.79(0.44-7.21)
Duration in sex work business, years		p=0.626	p=0.813
< 1	31/74(42%)	1	1
1-<3	53/134(40%)	0.91(0.51-1.62)	0.86(0.46-1.58)
3-<5	29/59(49%)	1.34(0.67-2.67)	1.18(0.56-2.50)
≥5	22/48(46%)	1.17(0.56-2.44)	0.99(0.44-2.19)
Female genital mutilation[9]		p=0.530	p=0.678
No	82/185(44%)	1	1
Yes	53/130(41%)	0.86(0.55-1.36)	0.90(0.56-1.46)
Ever drank alcohol		**p=0.025**	p=0.167
No	25/78(32%)	**1**	1
Yes	110/237(46%)	**1.84(1.07-3.15**)	1.51(0.84-2.74)
Ever smoked cigarettes		**p=0.018**	p=0.364
No	82/214(38%)	**1**	1
Yes	53/101(52%)	**1.78(1.10-2.87)**	1.30(0.74-2.31)
Ever taken any illicit drug[10]		**p=0.002**	**p=0.041**
No	91/239(38%)	**1**	**1**
Yes	44/76(58%)	**2.24(1.32-3.78)**	**1.91(1.02-3.57)**
Ever heard of HPV		p=0.272	p=0.432
No	127/301(42%)	1	1
Yes	8/14(57%)	1.83(0.62-5.40)	1.57(0.50-4.91)
Ever had HIV test		p=0.260	p=0.251
No	11/20(55%)	1	1
Yes	124/295(42%)	0.59(0.24-1.48)	0.57(0.21-1.50)

1*-p-values were obtained from Wald tests;* ***2*** *– p values were obtained from Likelihood Ratio tests;* ***3****- Level 1 factors were adjusted for age, religion, highest education level, quranic education, monthly income, ownership of television and radio, and current marital status;* ***4****- No religion - one participant had has no religion;* ***5****– Other job titles – petty trading, seamstress and teaching;* ***6****–N – Naira-Nigeria currency; USD –United States Dollar;* ***7****– Living alone;* ***8****- Level 2 factors were adjusted for age, religion, quranic education, monthly income, ownership of television and radio, and current marital status (core variables from Level 1) and illicit drug use;* ***9****- Female genital mutilation was based on the clinical examination of the female external genitalia for evidence of genital circumcision by the research nurse at the clinic (Yes or No); 11-Illicit drugs are banned substances or drugs taken by participants for non-medical reasons in Nigeria*

5.4. DISCUSSION

This study showed a very high prevalence of vulvar, cervical and anal HPV infections, and a low prevalence of oral HPV among brothel-based FSWs in Ibadan, Nigeria. Specifically, HPV infection was most prevalent in the vulvar (87.9%) followed by the cervical (84.0%), anal (74.6%) and oral (24.1%) samples. In addition, the prevalence of multiple HPV infections also followed similar patterns of distribution with the highest proportion in the vulvar samples. Generally, HPV prevalence was higher among FSWs who were between 18 and 25 years compared to other age groups. The commonest HR-HPV genotype was HPV-35 in the four anatomic sites and HPV-68 was as common as HPV-35 in the vulvar samples. The second most common genotypes were: HPV-58 in the vulvar samples; HPV-68 in the cervical samples, HPV-51 in the anal samples and HPV-16 in the oral samples. HPV-16 was ranked fourth among the HR-HPV in the vulvar, cervical and anal samples. The most common LR-HPV genotypes was HPV-53 in the vulvar, cervical and anal samples and HPV-44 in the oral samples.

The proportions of FSWs with oro-genital HPV infections in this study was, perhaps not surprisingly, higher than the prevalences by anatomical site reported among sexually active females in the general population in Ibadan, Nigeria, presented in Chapter 4. Although studies on HPV infection among FSWs have been largely focusing on cervical HPV infections worldwide with fewer studies on anal, vulvar and oral HPV [96, 212, 428-434], most of these studies have reported a relatively lower prevalence of any HPV and HR-HPV infection compared to the present study. Until now, there was only a study published that presented data on five anatomic sites of cervical, vagina, vulvar, anal, and oral sites among 188 FSWs in Spain (2004); the study found HPV to be most prevalent in the cervical (27.8%), followed by the vaginal (26.1%), vulvar (22.9%), anal (15.0%) and oral (7.9%) sites[427]. In another study in Hungary (2013), three samples were collected from the cervical, anal and oral sites among 34 FSWs and 52 women in the general population[435]. The prevalence of any HPV infection was significantly higher among FSWs compared to women in the general population for both cervical (64.0% versus 34.6%, p=0.006) and anal (50.0% versus 15.4%, p=0.001) samples except in the oral samples (20.6% versus 7.7%, p=0.103)[435]. In the same study, FSWs also had more HR-HPV and LR-HPV infections than women in the general population [435].

Two cross-sectional studies (one each from Togo and the Netherlands) among FSWs reported on the prevalences of anogenital HPV infections[429, 436]. The study conducted in Togo among 310 FSWs (21 – 32 years) found an infection rates of any HPV and any HR-HPV of 45.2% and 32.9% in the cervical, and 34.8% and 20.7% in the anal sites, respectively[429] . The observed higher prevalence in the cervical samples compared to anal samples among FSWs in the Togo study was similar to the present study[429]. However, another study from the Netherlands conducted among 304 FSWs (25-37 years) showed a slightly higher prevalence of any anal HPV of 80.0% and any LR anal HPV of 57.0%, but a lower prevalence of any HR anal HPV of 50.0% compared to this study [436]. The relatively high prevalence observed in the Netherlands study might be due to high proportion of FSWs with STI complaints whereas, the FSWs that were recruited in the Togo study did not present with STI complaints. STI had been shown to be a co-factor for HPV acquisition and it is also associated with slow clearance rate of HPV infection[437, 438].

Two Kenyan studies estimated the prevalence of HR-HPV cervical HPV infection among FSWs. A study among 296 FSWs in Nairobi found an infection rate of 54%[434] whilst another study among 616 FSWs (≥ 18 years) in Western Kenya reported a prevalence of 57.7% [96]. Both studies also reported multiple HPV infections of 28.0% in Nairobi and 32.8% in Western Kenya[96, 434]. Another study among 360 FSWs (16-54 years) in Burkina Faso showed a prevalence of cervical HPV of 66.1%[439]. Studies from Europe and Asia have reported a wide range of prevalences of cervical HPV prevalence among FSWs ranging from 25.0% to 85.0%[93, 430, 432, 433, 440, 441]. The observed high prevalence of cervical HPV among this cohort of FSWs in Nigeria and the wide range of prevalence in previous studies in Europe might be due to differences in the age range of participants and HPV genotyping techniques[93]. The age cut-off in a number of previous studies were above 50 years compared with the upper age limit of 45 years used in this study.

The data on oral HPV infection among FSWs in this study are the first coming from such population in SSA. Oral HPV infection was higher in this study than two previous studies that reported oral HPV in FSW; 7.6% among 185 FSWs (18-26 years) in Peru and 6.1% among 196 FSWs (18-45 years) in Japan [212, 431]. The observed difference in oral HPV prevalence might be due to the sensitivity of diagnostic tests to detect HPV infection.

Just as in previous studies, the presence of concomitant HPV infection in other genital and or anal sites was a common risk factors for detection of HPV infection in a specific anatomical site [429, 436]. Concomitant vulvar HPV was associated with the detection of cervical and anal HPV infections, and vice versa. Association between anal and cervical or anal HPV infections had been previously reported[429]. The Togo study observed an increased risk of anal HPV infection among FSWs that were also positive to cervical HPV infection, particularly those with added premalignant lesion of the cervix[429]. The presence of concomitant vaginal HPV infection was found to be a risk factor for anal HPV infection in the study from the Netherlands, and vice versa [436]. As mentioned in Chapter 4, the risk of concomitant HPV infection has been explained by the concept of viral shedding between contiguous anatomic structures and autoinoculation that may be due to sexual risk behaviours or unhygienic practices [442]. The observed association of concomitant HPV infection between two or more anatomic sites has the benefit of providing a clinical suggestion to offer a screening protocol for multiple anatomic sites [442]. For example, an individual with positive HPV DNA with premalignant lesion of the cervix may also be offered opportunity to screen for premalignant lesions of the anus.

HIV infection was another important risk factor that was common to cervical and oral HPV infections in this study. A number of other studies among FSWs have shown an increased risk of cervical and anal HPV infection among HIV positive compared to HIV negative [429, 430]. The association between HPV and HIV is bi-directional and synergistic, HIV could be a risk factor for HPV acquisition and vice versa [443, 444]. It has been shown that HPV infection through the E7 protein could alter the integrity of epithelial lining by disrupting the epithelial adhesion molecules and cause alteration of the Langerhans cells, known to internalise HIV [443, 445, 446]. This cascade of events caused by HPV infection can make the host cell vulnerable to HIV infection [446]. Furthermore, HIV and HPV share similar risk factors for acquisition such as early age of first sexual activity, multiple sexual partners, condomless sex and presence of other STIs [444]. HPV infection acquisition, clearance, persistence, and disease progression to intraepithelial neoplasia and cancer may be increased in people with immunodeficiencies such as HIV infection [444, 447]. Furthermore, interventions that reduce HIV risks like male circumcision and anti-retroviral treatment had been associated with reduced rate of HPV acquisition [444, 447].

Another interesting finding was the reduced risk of cervical HPV infection among FSWs with clinical evidence of female genital mutilation. The reduced risk of cervical HPV infection among those with a history of female genital mutilation may be due to the reported reduced sexual activity from lack of sexual pleasure or orgasm and or increased sexual dysfunctions among such people [448, 449]. However, a large retrospective study of 2,398 women (18-90 years) in Senegal observed an increased risk of invasive cervical cancer among women with evidence of female genital mutilation after adjusting for HIV infection, presence of HPV in the subjects and other benign and premalignant cervical lesions [450]. The increased risk of cervical cancer among women with history of female genital mutilation was ascribed to be due to increased risk of chronic inflammation of structures around the areas affected by the mutilation[451]. Chronic inflammation could be a co-factor in the biology of HPV infection acquisition and persistence[451]. The real interaction of how genital mutilation is linked to chronic inflammation and subsequent HPV acquisition is not fully established. The observed association between female genital mutilation and HPV infection could be confounded for the reason that genital mutilation tends to be common among women from low socioeconomic class, who live in rural community and those that lack access to health-related information [452].

In this study population, earning a relatively high monthly income was associated with the risk of anal HPV infection. It is possible that FSWs might be engaging in sexual risk behaviours in exchange for more money from their customers[371]. In the qualitative study that was presented in Chapter 3, the participants described how customers were offered high-risk sexual acts in exchange for increased money and sometimes, they also alluded that clients that desired anal sex are usually prepared to pay more money to them. History of anal sex by FSWs was not associated with anal HPV infection in this study. There is the possibility of under reporting of anal sex in this study because FSWs might found disclosure of anal sex to be embarrassing to them. It is also plausible to acquire anal HPV infection without a history of anal sex; anal HPV could be acquired from viral shedding or contiguous anatomic sites with HPV infection. Other risk factors associated with the genital cervical and anal HPV infections in previous studies were the presence of other STIs, sexual risk behaviours such as multiple sexual partner, age of regular sexual partner, age of first vaginal sex, inconsistent condom or

barrier methods, condomless vaginal and anal sex, intravaginal practices and illicit drug use[435, 441]. Oral HPV infection was also associated with oral sex and smoking in other studies [212, 435]. However, both oral sex and smoking were not associated with oral HPV in this study. Contrary to the previous reports that found HPV-16 or HPV-31, HPV-51 or HPV-58 as the most frequent genotypes in the cervix and anus of FSWs [432, 433, 435], this study showed that HPV-35 was the commonest HR-HPV in the four anatomic site samples. Furthermore, HPV-35 was also the most common genotype with concordance in all four anatomic sites. Unfortunately, HPV-35 is not covered in any of the available HPV vaccine types.

The proportion of FSWs that received oral sex (43%) from male sexual partners was higher than the proportions that had given oral sex (19%) to a male sexual partner, and majority did not use condom during the last episode of oral sex in this study. However, a study in Australian found that 25% of 1168 FSWs that admitted practicing fellatio did not always use condom consistently [453]. There is evidence that oral STIs are more efficiently acquired by fellatio compared to cunnilingus due to high risk of traumatic injuries to the soft palate and oedema in the area of contact, which could serve as a portal for the acquisition of infection[454, 455]. Association between history of ever given oral sex and income of FSWs confirmed the information provided during the FGDs and IDIs in chapter 3 that FSWs charge extra money to allow their male clients to have oral sex with them. The use of illicit drugs was found to be associated with cunnilingus in this study. A study in the USA has shown that FSWs sometimes engage in oral sex in exchange for illicit drugs[456].

The major strength of this study was the collection of data for HPV genotyping from four anatomic sites at the same time, and this was probably the first largest study till date with such a diverse anatomic samples among FSWs. The study used a probability sampling to select study participants, and also limited her study population to a homogenous sample of brothel based FSWs. This was unlike previous studies that combined different sub-groups of FSWs from brothels, entertainment venues and streets, while other studies did provide information on the sub-group of FSWs that were recruited[96, 427, 429]. Some studies had demonstrated that sexual behaviours and associated risks among different sub-group of FSWs might not be the same [457-460]. A study in China found that street-based FSWs had more risk behaviours

than establishment-based FSWs, there was a higher report of inconsistent condom use and anal sex with clients among street-based FSWs relative to the establishment-based FSWs [457]. Another important strength of this study is the low refusal rate among the participants recruited.

This study has some potential limitations. This study was a cross-sectional design that cannot be used to explain causality of risk factors of HPV infection. The design cannot also explain the time of HPV acquisition, clearance and persistence. The age limit of 18 to 45 years used in this study excluded some FSWs from these analyses and this could introduce some selection bias, and potentially limit the generalisability of results. Although, the young age of the study population might have accounted for the observed high prevalence compared to other studies, but this is not clinically relevant given the transient nature of HPV infection. It is also possible that the selection of all FSWs at brothels that had less than 10 people could also introduce selection bias. However, the selection of participants from the sampling frame was almost exhaustive which could limit the risk of selection bias. The history of STIs were obtained by the clinical nurses and participants found to have STIs were offered syndromic management of STIs. However, there was the possibility of missing asymptomatic STIs. There was no information on the state of premalignant lesions in any of the study participants.

5.5. CONCLUSION

HPV infection was substantially higher among brothel-based FSWs in Ibadan, Nigeria compared to similar studies from other settings, and the commonest HR-HPV genotype (HPV-35) in this study was similar to the type found among the female population in the community in Nigeria. It is recommended that future studies should include other categories of FSWs such as the streets and entertainment venues who might be more vulnerable to HPV infection, as well as, designing longitudinal studies that will be able to answer other critical issues of the epidemiology of HPV such as the incidence, clearance and persistence among this special group of women in the community.

CHAPTER 6: DISCUSSION

PREAMBLE

In this chapter a summary of key findings presented in the thesis will be given, followed by a review of the strengths and limitations of the studies, public health implications of the results including other important observations unrelated to HPV such as the female genital mutilation, recommendations and concluding statements.

6.1. SUMMARY OF KEY FINDINGS OF THIS THESIS

6.1.1. Knowledge, socio-cultural interpretations and different ways of learning sexual behaviours

Data presented in this thesis showed that Nigerian adolescents and adults are knowledgeable about different sexual behaviours. The adult males, adolescent and young adult males and females and FSWs demonstrated a greater understanding of specific definitions or slang terms related to these behaviours compared with the adults or married women in the general population. The young people and FSWs were able to explain subtle differences between different sexual behaviours. For example, adolescents and young adult males and females were able to differentiate between “giving” or “receiving” oral sex and “insertive or receptive” anal sex, as well as explaining different sexual partnerships such as heterosexual and same sex partnerships.

Generally, there were more robust discussions about oral sex than anal sex; participants associated oral sex with heterosexual sexual relationships while anal sex was described as either “foreign” or exclusively practiced by homosexuals. In addition, the notion that anal sex was not culturally acceptable was also demonstrated by FSWs who often considered that anal sex should not be openly discussed except among a trusted clique. Participants considered anal sex to be more stigmatising than oral sex, which is why it was being performed clandestinely. It is therefore not surprising that during the qualitative study, despite participants openly admitting that they had experienced anal sex, only one participant out of 310 women in the general population face-to-face interview for the cross-sectional study admitted to any previous experience of anal sex. Similarly, only eight out of 315 FSW reported

ever practising anal sex, despite the assertions in this study and previous studies among FSWs that anal sex can be used to negotiate for more money from male clients [371, 461, 462]. Since financial incentives was the most common reason why women practiced sex work, one would have expected that many FSWs that participated in the SHINI study would have reported anal sex experience [419, 424]. It is also plausible that participants might be afraid to openly discuss anal sex because of the link between anal sex and homosexuality in the country. Nigeria has banned same sex marriage and made it a punishable offence [463].

In this study, whilst the young people (18-25 years) freely described the sources of information they used to learn about different sexual behaviours, the adult participants were reluctant to discuss their sources of information pertaining to oral and anal sex. Generally, participants learnt oral and anal sex from watching pornographic films, sexual partners and friends. Similar sources of information have been reported in previous studies, with watching pornographic films being the most common [365, 464]. Watching sexually explicit films could generate curiosity [346], which may provoke interest in young people, as demonstrated in this study when some adolescents mentioned adventure as the sole reason for practising oral or anal sex [365, 464]. However, a study among 175 university students demonstrated that participants considered that learning about sexual activity through watching pornographic films was overrated among other sources of information and the majority believed that learning through peers was the most common method [465].

6.1.2. Attitude, motivations, potential health risks and stigma for engaging in oral and anal sexual behaviour

The motivation for engaging in oral and anal sex appeared to be driven by different gender perception and fear of poverty. Most women in the study reported reluctantly allowing their male sexual partners to practice oral and anal sex because of the fear of losing them to other competitors. Women appear to perceive the protection of their sexual relationship as their responsibility and some female participants allowed their partners to have oral and anal sex with them despite experiencing some discomfort or health related challenges such as severe pain or bleeding. A study in South Africa also found women engaging in heterosexual anal sex against their personal wishes in order to secure their sexual relationships [323]. Other reasons

for practising oral sex among women may possibly be to obtain or seek favours from men. This is further corroborated in the quantitative study in Chapter 4 where transactional sex was found to be associated with the report of ever engaging in oral sex among women.

Understandably, the struggle for survival and fear of poverty was the most frequently mentioned reason for engaging in oral and anal sex among the FSWs. Negotiation for higher fees incentivised FSWs to engage in sexual risk behaviours such as condomless sex, as well as oral and anal sex with their male clients despite their knowledge of potential associated health risks [303, 304]. Similar reasons for engaging in oral sex could be deduced from the cross-sectional study. FSWs who earned better monthly pay had greater odds of ever having given or received oral sex. Previous studies from South Africa and in developed countries have documented that FSWs negotiate for increased fees in exchange for sexual risk behaviours [371, 466, 467]. In another study, FSWs had been reported to negotiate for unsafe sex in exchange for illicit drugs [468]. In this study, illicit drug use by FSWs was associated with nearly two times the odds of reporting ever receiving oral sex from a male client. However, sex in exchange for illicit drugs was not explicitly mentioned by FSWs in both the qualitative and quantitative SHINI studies.

The majority of young people (18-25 years) and adults had good knowledge of associated health risks with oral and anal sex. In the qualitative study, women itemised more health-related concerns with respect to oral and anal sex than men, whilst they also expressed more concern regarding their health, in conjunction with their social and emotional wellbeing. The health risks that were highlighted to be associated with oral and anal sex were STIs, HIV, HPV and cancer. There was also an anxiety around other possible diseases or infection that might not be known now but could cause problems for them in the future. This contrasts with a study in the UK among males and females that showed that participants were not concerned about contracting any disease from anal sex, although male participants were more worried about their personal hygiene from faecal soilage [469]. In the same study, male participants were also afraid of the social stigma associated with giving a female partner oral sex [470].

6.1.3. Prevalence of oral, genital and anal HPV infections among women and FSWs

The two SHINI cross-sectional studies presented one of the largest data on the epidemiology of HPV infection in the cervical, vulvar, anal and oral anatomic sites among sub-Saharan African women from the general population and from brothels. The study established a high prevalence of any HPV, HR-HPV, LR-HPV and multiple HPV infections among women in the general population and FSWs in all the four anatomical sites. As expected, there were higher prevalences of HPV infections among FSWs, although these prevalences followed the same pattern of the highest prevalence in the vulvar samples and lowest in the oral samples. Generally, FSWs are occupationally more exposed to sexual risk behaviours and at higher risk of STIs, including HPV infection, compared to women in the general population.

The relative high prevalence of HPV among the youngest group (18-24 years) of participants in both population groups is not surprising; the incidence of HPV infections tends to be very high around the period of sexual initiation and genotype-specific infections typically clear over time. However, the high HPV prevalence among the adult population could suggest persistence, reactivation of old infections or new infections.

The prevalence of cervical HPV among women in the general population in this study (59.7%) was higher than previous similar studies in Nigeria that reported cervical HPV prevalences of between 26.3 and 37.0% which were conducted 5-10 years ago[163, 381]. This may be due to a number of reasons. First, the age range of eligible participants in the SHINI study was narrower compared to previous Nigerian studies that included women with a wide age range including women aged 50 years and above. There were more younger participants in this study than previous Nigerian studies. Second, HPV is becoming more prevalent due to changes in sexual behaviours, condom use and number of sexual partners. Third, the HPV diagnostic tests that were used in the previous studies in Nigeria excluded LR-HPV and some HR-HPV genotypes. Several of the previous studies also used DNA primers that may not be as sensitive as the Anyplex II HPV28 [381, 382, 471-473]. A study showed that MY09/MY11 consensus primers have a lower detection rate for HPV relative to the more recent PCR platforms [381, 471].

The prevalence of any anal HPV in this study (56.8%) is higher than the reported prevalence of 41.8% reported by GeneXpert and 40.8% from Hybrid capture techniques among HIV positive women in South Africa [74]. Both the Hybrid capture and GeneXpert methods detect lower numbers of HPV types per sample relative to the Anyplex II platform [474]. Additionally, the low prevalence of vulvar HPV reported in a Chinese study compared with this study could be due to the higher proportion of older women in the Chinese study [133].

The high prevalence of vulvar HPV infection (87.9% versus 68.6%) compared to the cervical (84.0% versus 59.7%) and anal (74.6% versus 56.8%) HPV infections in both FSWs and women in the general population may possibly be due to any of these theoretical reasons. The vulva is the most externally sited anatomical structure of the three anatomical sites, making it at a high risk of contamination. It is also plausible that viral shedding from the cervix and anus can contaminate the vulvar area and be detected without this being true vulvar infection. The strong association between the risk of detecting vulvar HPV infection and the concomitant cervical and anal HPV infections observed in both FSWs and women in the community also confirms the possibility of a common source of HPV infections.

6.1.4. Risk factors associated with HPV Infections in different anatomical sites

The socio-demographic and behavioural factors associated with HPV infections in the two SHINI cross-sectional studies were different. The findings from SHINI study showed that participants that earned high monthly income had the higher odds of having anal HPV infection among FSWs compared to others. Anal HPV infection was associated with high number of multiple sexual partners, concomitant cervical, and vulvar HPV among women in the general population. Anal HPV infection was also associated with vulvar HPV infection among FSWs. The observed strong association between concomitant oral and genital HPV infections or between two genital sites HPV infections have also been reported in several studies among women in Europe, USA and Australia [111, 128, 133, 475].

Although the qualitative study (Chapter 3) suggests that both women in the community and brothels engaged in receptive anal sex, the prevalence of reported anal sex in the two quantitative surveys was very low (1/310 in women in general population and 8/315 in FSWs), and this variable was not included in the risk factor analyses of anal HPV for chapter 4 and 5. Five published studies that explored association between receptive anal sex and HPV infection in women were reviewed [24, 125, 476-478]. Of these, two defined anal sex, one in Brazil and one in the United States (US) [125, 478]. The Brazilian study reported a unadjusted association between a reported history of ever having had anal sex and the presence of any anal HPV infection (Chi square; p=0.001) among women in Victoria[125]. The US (Hawaii) study reported an adjusted association between reported history of ever having anal sex and the presence of any anal HPV infection among women in Hawaii (AOR=1.79; 95% CI 1.10-2.90)[478]. In this study, the 'ever' category was stratified into 'current' (defined as within the last three months) and 'past' (undefined) anal sex. There was a strong adjusted association between the reported current history of anal sex and presence of any anal HPV infection (AOR=3.13; 95% CI 1.28-7.66); however, the adjusted association between reporting a past history of anal sex and any HPV infection was much weaker (AOR=1.46; 95% CI 0.85-2.51)[478].

Cervical HPV infection among women in the general population was found to be associated with high multiple vaginal sex partners, concomitant vulvar, anal and oral HPV infections. Women aged 35 years and older had lower odds of cervical HPV. Previous studies conducted in Nigeria women in the community also showed an increase in risk of cervical HPV among women that are divorced or separated, who had no job or no monthly income and those that had no education [91, 163]. Other factors that were found to be associated with cervical HPV infections were early sexual debut, use of hormonal contraception, HIV infections, intravaginal practices, transactional sex, alcohol and cigarette smoking [10, 381, 479, 480]. Among FSWs in the SHINI study, cervical HPV infection was also associated with being HIV positive and having concomitant vulvar HPV infection.

The strong evidence between oral HPV infection and HIV infection among women in the general population in this study has been previously reported [108]. The possible biological

explanation is that HIV can cause immunosuppression that makes an individual vulnerable to acquiring a new HPV infection, persistent infection and reduced rate of HPV clearance. The history of oral sex as a risk factor for oral HPV infection is mixed [107, 481]. Some studies reported a strong association between oral sex and oral HPV among females while others found no association [45, 107, 388]. A systematic review showed that oral HPV was significantly associated with having multiple oral sex, but not with the report of ever had oral sex[45]. Two meta-analyses of data in 2016 and 2018 involving 29 and 48 studies showed that women with history of smoking have higher risk of oral HPV than those without previous history of smoking [45, 108].

Regarding the risk factors associated with vulvar HPV infections, women in the general population who were separated or divorced or currently married had lower odds of HPV infection relative to single women. Women whose age difference with their first vaginal sex partners was six years and above had lower odds of vulvar and anal HPV infections. In the general population and brothel participants of this study, concomitant cervical and anal HPV were found to be strongly associated with vulvar HPV. Association between genital sites HPV infections have also been reported among women in the general population and FSWs.

6.1.5. The concordance of HPV genotype-specific infections in different anatomical sites

The concordance rate of specific HPV genotype infection in two anatomical sites was higher than the comparison of HPV genotypes in three or four sites. Generally, the concordance rate in two anatomic sites among the FSWs was higher than the concordance rate among women in the general population. In both FSWs and women in the general population, the concordance rate was highest between cervical and vulvar samples, followed by the cervical and anal samples in FSWs and vulvar and anal samples in women in the community. The lowest concordance rate of HR-HPV was between oral and cervical samples in both populations. A similar pattern of concordance was observed for any LR-HPV genotypes in both population groups.

The observed high concordance rate between two contiguous anatomical sites is suggestive of a possible autoinoculation theory as there was no strong evidence of association between sexual behaviours of participants and HPV infections in any of these anogenital sites in this study. The concordance of HPV-16 infection in the cervical and anal samples was the highest of any HPV genotypes. This finding was also seen in a global meta-analysis that found a strong association between HPV-16 in the cervix and HPV-16 in the anus of the same individual [408]. In that study, the association of HPV-16 between the cervix and anus was found to be higher among HIV positive women than HIV negative. This could explain why a history of cervical, vulvar and vaginal cancers is a strong risk factors for HPV-associated anal cancers, in addition to immunosuppression, smoking and in men who have sex with men. Anal cancer is rare. It is more common in women than men [482]. It is now being advocated that anal cancer screening should be considered in women that have premalignant lesions of the cervix, particularly, when the associated HPV genotype is HPV-16. Although, there may be no data currently to back up similar observations between the vulva and cervix, the strong association between these two sites in this study suggest a need to always check for vulvar lesion among women with premalignant cervical lesions with positive HPV 16.

6.1.6. Implication of the specific HPV genotypes detected in the oral, genital and anal sites

HPV-35 was the most prevalent HR-HPV genotype detected in the four anatomical sites among FSWs (4.3-20.1%) in addition to being the most concordant HR-HPV genotype in the four anatomical sites - cervical, vulvar, anal and oral - among FSWs. The most prevalent HR-HPV genotypes among women in the general population was HPV 35 in the cervical (8.5%) and vulvar (8.7%) samples, HPV 52 (8.9%) in the anal samples and HPV 51 (3.2%) in the oral samples. HPV-16 was the most concordant HR-HPV genotypes in the four anatomical sites among women in the general population and the seventh concordant HR-HPV behind HPV-35, -33, -51, -39, -18, -39 and -52 among FSWs. HPV-16 and 18 are the most common genotypes in high-grade intra-epithelial lesions and invasive cervical cancer and Nigeria as well as in many countries in SSA and globally [162, 483, 484].

According to Okolo et al, HPV-16 accounted for 67.6% (95% CI, 55.2-78.5) of ICC, followed by HPV-18 in 10.3% (95% CI, 4.2-20.1) and HPV-35 in 5.9% (95% CI, 1.6-14.4) among 1,203 samples of histologically confirmed ICC examined in Ibadan [162]. Data on HPV-associated anal, vulvar and oral cancers in Nigeria are rare. However, in 2019, a review of 738 cases of anogenital cancers from three referral hospitals in Rwanda found HPV-16 to be the commonest with a prevalence rate of 55.0%, 46.7%, 50.0% and 80.0% in the cervical, vulvar, vaginal and anal cancer samples, respectively [483]. Similarly, HPV-16 was also determined to be the most prevalent HR cervical HPV infections in women in West, East and Southern Africa [485-487]. The observed high prevalence of HPV-35, a genotype that is not covered by any of the three HPV licenced vaccines, may require further studies to compare its progression and clearance and persistence rates with HPV-16/18 among women. Persistence of HPV-35 could possibly increase the burden of a new variety of cervical cancer in the country.

6.2. STRENGTHS OF THE THESIS

The thesis included women in the general population and a section of a key affected population, brothel-based FSW, to document sexual behaviours and the epidemiology of HPV infections in Nigeria. The sequential mixed methods design offered a good opportunity to seek information from people in the community on the meaning, interpretations and reactions towards sexual behaviours during the qualitative study, whilst their valuable suggestions assisted in designing an acceptable tool to collect the quantitative data. For example, during the qualitative study, we learnt from the participants that a simple definition of oral and anal sex would be preferred and acceptable instead of using slang terminology.

The SHINI project provides the first and the largest data on HPV epidemiology involving four different anatomical sample sites among sexually active women and FSWs in SSA. The studies explored the relationship between sexual behaviours and HPV infections and the different pattern of concordance rates were also analysed and presented. The study also offered information to compare the epidemiology of HPV women in the general population and FSWs.

The studies had a low refusal rate for participation, particularly among FSWs, which potentially increases the representativeness of the findings. The high participation rate was probably due to the rigorous community engagement and advocacy visits that were employed

prior to the commencement of the study. We worked with experienced individuals in the community as gatekeepers for both the household and brothel surveys to facilitate smooth access into the study sites. The research team also engaged the services of senior staff of Oyo State Government including the National Population Commission to have access to population data, identified study sites, and assisted in the boundary delineation. The use of gender matched research assistants and nurses to conduct interviews, clinical examinations and the collection of samples may possibly have also helped to reduce the chances of refusal among the participants.

Another strength was the quality of information collected on oral and anal sexual behaviours among women in the general population and FSWs. In both the qualitative and quantitative studies of this thesis, a clear definition of different sexual behaviours was used to ensure case ascertainment. Participants during the FGDs and IDIs defined oral and anal sex and used these definitions to further discuss their experiences. Similarly, interviewers used simple definitions of different sexual behaviours to ask questions during the cross-sectional study to ensure accurate information was collected during the interviews.

6.3. LIMITATION OF THE RESEARCH FINDINGS

6.3.1. Generalisability issue

The relatively small number of FGDs and IDIs conducted among FSWs during the qualitative study and the sampling strategy used during the quantitative study could limit the generalisability of the findings obtained in this thesis. Although a qualitative study does not require calculation of power to determine whether or not the sample size is adequate, it remains desirable that there should be adequate representation of potential participants to exhaustively discuss or answer the research question, depending on the theoretical concept [488, 489]. In this study, 18 FGDs and 39 IDIs were conducted among the people in the community compared to 2 FGDs and 5 IDIs among FSWs. The relatively small number of interviews and discussions among FSWs might not have exhaustively presented all views on sexual behaviours. For example, conducting an FGD among homogenous group of FSWs could have brought depth to some particular aspect of the discussion, which may not have materialised due to group dynamics. There are other FSWs who are not brothel based that

might provide a different perspective on the different sexual behaviours that were discussed. One more issue that can potentially affect generalisability was the error that occurred during the second stage sampling of female participants in the community in the quantitative cross-sectional study in Chapter 4. The unfortunate error that occurred during the second stage sampling of potential participants in the community make it difficult to calculate population estimates.

The SHINI study enrolled women aged 18-45 years in both cross-sectional studies and therefore there are no data on sexually active women who were outside this age range. Available data in Nigeria suggest that the average age of vaginal sex debut in females is 16 years with variations across the six geo-political zones in the country [490, 491]. Women who are 45 years and above are sexually active and may also engage in sexual risk behaviours. Exclusion of women aged 45 years and over may be one of the reasons why a second peak of HPV prevalence was not observed in the SHINI study. The non-inclusion of young adolescents (<18 years) in this study is another potential source of limitation that could limit the generalisability of findings. It is plausible that young adolescents aged less than 18 years might have different behavioural pattern on sexual risk behaviour.

6.3.2. Lack of information on causality

The cross-sectional design of the two quantitative studies cannot provide data to establish temporal causality between any of the explanatory variables and HPV infection in the risk factor analyses. The design also means that there are no data on the incidence, persistence and clearance of new HPV infections among the study population.

6.3.3. Social desirability bias

The stigma around sexual behaviour is associated with social desirability bias which can negatively affect the quality of data collected. Social desirability bias could occur during FGDs and IDIs, or during the face-to-face interviews in the cross-sectional study, especially when sensitive issues are been discussed. A number of participants, both in the community and brothels, mentioned during IDIs that they only shared their anal sex experiences with “trusted friends or clique”.

The face-to-face interviews could cause under- or over-reporting of sexual behaviours by participants. There is also a possibility of gender motivation bias during a face-to-face interview on sexual activity. Generally, males tend to exaggerate their sexual experience as a marker of their sexual maturity [492, 493]. Despite young people in the qualitative study discussing their experiences included of oral and anal sex, only one participant volunteered information on her experience of anal sex out of 310 participants sampled in the community and only eight people among the FSWs during the survey. Under-reporting of anal sex may well have occurred since both population groups had a high results of anal HPV infections despite very few participants reporting receptive anal sex.

6.3.4. Important explanatory variables that were not measured

There were some valuable explanatory variables that should have been included in the study but they were not included due to limitations with logistics and the budget. For example, an STI diagnosis was made following a clinical history and examination conducted by a research nurse without any laboratory tests. Laboratory evidence of reproductive tract infections, including bacterial vaginosis, would have provided more insight on the biological factors associated with the epidemiology of HPV infection in this study.

The research did not provide information on the pattern of pre-malignant lesions in the study population. Studies have shown that the prevalence of HPV infection tends to be higher among subjects that have abnormal cervical cytology or histological evidence of microinvasive cancer than those with normal cytology [162, 494]. For example, in the Idikan study in Ibadan, Nigeria, the prevalence of cervical HPV infection was 24.8% and 40.9% in women with normal and abnormal cytology, respectively [381]. The study did not collect information on HPV vaccination history. Although Nigeria has not introduced routine HPV vaccination, some Nigerians have been purchasing HPV vaccine from private practitioners. A dose of HPV vaccine in Nigeria costs about 5.0 USD in Nigeria which is not affordable for many Nigerians.

6.3.5. Sources of missing data in SHINI study

There were certain variables with missing observations in the results. Missing observations typically bias results, especially when there is a significant difference in the characteristics of

participants with and without missing results. During the study, we conducted quality check to minimise this problem. Two of these quality checks were conducted in the field before participants left the clinic, while a third check was also conducted prior to data entry into the REDCap server (*Vanderbilt University, Nashville Tennessee, USA*)[394, 396]. Despite these measures, some data were still missing. In addition, participants that gave a response of "can't remember" or declined to answer a question were also considered as missing observations. Furthermore, the biological samples that were categorised as invalid samples in the laboratory for HPV genotyping were also treated as missing observations. Although the number of invalid samples was relatively small in the anogenital samples, a high number of invalid samples were detected in oral samples, particularly among FSWs (33/315; 10.5%) compared to women in the community (24/310; 7.7%). Exclusion of these invalid samples can potentially bias the results of HPV prevalence.

The Anyplex II assay does not detect all HPV genotypes and for this reason, it is possible that some HPV genotypes may have been missed in this study [495]. Roche Linear array technology that can detect 37 different HPV genotypes was not used because of the high cost of budget compared to the Anyplex II assay.

6.4. PUBLIC HEALTH IMPLICATIONS OF THE RESEARCH FINDINGS

The findings from this thesis have a number of public health implications for Nigeria and for SSA. Nigerian young people and some adults engage in different sexual risk behaviours and the poor risk perception and lack of necessary information that will encourage safe sexual behaviour among women will continue to increase the rate of acquisition and transmission of STIs including HPV in the community as they may not appreciate the health problems associated with these sexual behaviours. Despite the legal restriction on sexually explicit movies in Nigeria, the data from this study, like other previous studies, showed that pornographic films remained one of the most common sources of learning about sexual activity, particularly among the young people in the country [496-498]. Some Nigerian studies also reported that young people used internet on their mobile phones or computers and through television programme to watch pornographic film [496-498]. Watching pornographic films has been associated with sexual risk behaviours, including engaging in condomless vaginal, oral and anal sex in Nigeria [496-498].

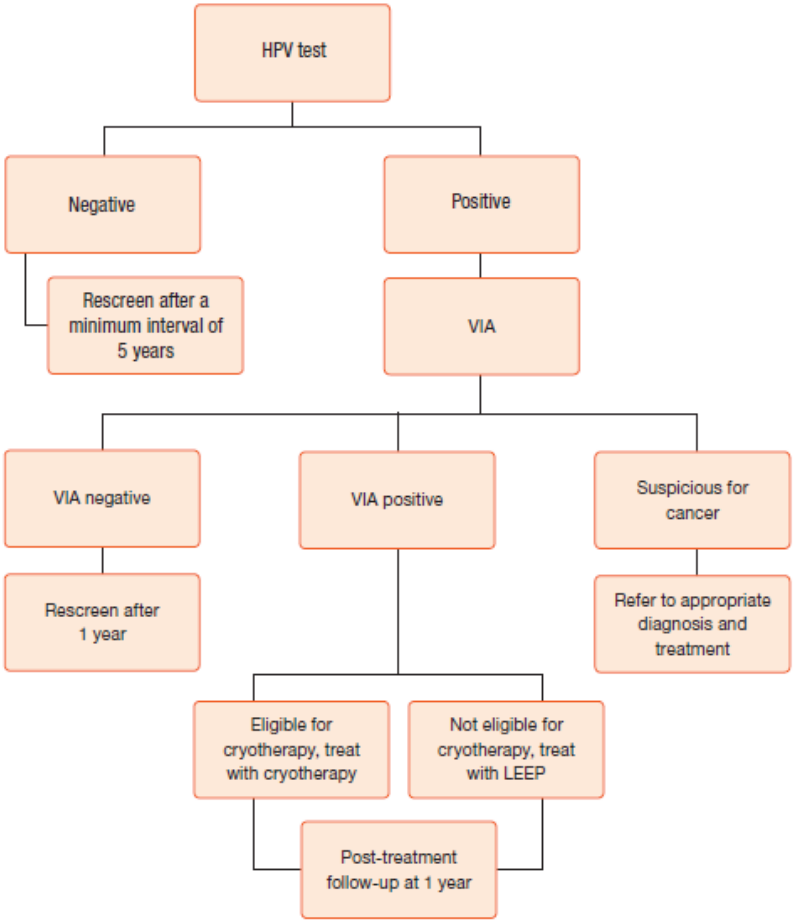
HPV awareness was low; only 4% among FSWs and 7% among women in the two communities had ever heard of HPV in a population that harboured a high prevalence of HPV infection. Nigeria has not yet introduced HPV vaccines. Previous studies among women of reproductive age groups in Nigeria have demonstrated poor knowledge of HPV, HPV vaccine and the associated morbidities [499, 500]. Studies in Nigeria showed that 4-10% of women were aware of HPV. Encouragingly, more than 80% of them were willing to allow their children to have the HPV vaccine if it was introduced [499, 501].

Although the Nigerian Federal Ministry of Health launched a five-year strategic plan for cancer control last year and made the implementation of HPV vaccine a priority as part of the effort to eliminate cervical cancer, Nigeria no longer receives GAVI grant support to procure HPV vaccine at subsidised amounts due to the country's weak health system and poor routine immunization indicators. HPV vaccination has been associated with a reduced burden of premalignant lesion and HPV-associated morbidities cervical cancer and genital warts [52, 502]. The data has the potential to assist experts and policy makers to provide hard evidence for an urgent need to prioritise HPV vaccination, promote massive campaign on HPV and HPV vaccine awareness. The SHINI data can also offer useful information to plan a robust community engagement strategy to break the myth of misconceptions and cultural barriers against the acceptance of HPV vaccination in Nigeria. For example, engagement of religious leaders may be a useful approach to gain trust of people in the community because the role of religion in sexual activity was highlighted in the qualitative study in Chapter 3.

Although the SHINI study did not provide information on the prevalence of pre-malignant lesions among participants, given the high prevalence of HPV in this setting and potential co-infection with HIV, especially in vulnerable populations like FSW, it is beneficial to plan and screen individuals that may harbour persistent infections. Currently, cervical cancer is the only HPV-associated cancer that is recommended for population screening, although some professional associations have also recommended screening for anal cancer among MSM in USA and Australia [503-505]. The WHO recommends cervical cancer screening at least once in a lifetime for every woman in low income countries. The most appropriate time for this screening is between the ages of 30 and 49 (Figure 6.1) [66]. In Nigeria, the recommended

screening algorithm is HPV DNA testing and VIA or Pap smear, followed by colposcopy for those with abnormal results. This approach, if well implemented in relation to every woman that is eligible in Nigeria will help to drastically reduce the burden of HPV infection, associated premalignant and malignant lesions.

Figure 6.1. Algorithm for Cervical cancer screening for low income countries



Source: Comprehensive cervical cancer control: a guide to essential practice – 2nd Edition (WHO 2014)

The high prevalence (41% in FSWs and 54% in the general population) of female genital mutilation observed among the study population underscores the importance of socio-cultural beliefs in SSA. It is also interesting that women who were residing in a peri-urban environment had a significantly higher proportion female genital mutilation than those living

in urban environment (61% versus 46%, p<0.001). This result is similar to the prevalence observed in the national demographic health survey and other similar studies in Nigeria that reported 40 to 50% of women undergoing genital mutilation [506, 507]. However, the SHINI study did not classify female genital mutilation based on the degree of the trauma. Female genital mutilation has been associated with poor sexual and reproductive health outcomes including post-traumatic stress disorders, sexual dysfunction and obstetric complications during childbirth [506, 508]. The observed association between female genital mutilation and the risk of HPV associated cancer may be confounded with socioeconomic factors – age, ethnicity, religious belief and wealth indices. The association between female genital mutilation and HPV associated cancer might be due to increase in sexual risk behaviours among those that had suffered from genital mutilation. For example, in this study, the odds of reporting a history of oral sex was two times greater among women in the general population who had female genital mutilation compared to those without any genital mutilation.

6.5. RECOMMENDATIONS

6.5.1. Sexual Health Education

The emerging pattern of sexual risk behaviours and high burden of HPV infections, specifically among young people requires urgent steps to increase awareness on safe sexual practices. In 2003, the Nigerian government introduced sexuality education labelled as Family Life and a HIV Education (FLHE) programme as a way to introduce health education to children and adolescents in schools [509]. The existing FLHE curriculum has been heavily criticised because of the narrow focus on abstinence alone [509]. It is recommended that the FLHE curriculum should be broadened to include other contextual sexual health related issues such as information about different sexual behaviours and associated health risks like HIV and HPV infections, as is currently being implemented in high-income countries. Some countries in Europe established youth friendly centres where sexual and reproductive health services including counselling for safe sexual practices are provided to the youths[510]. It is also important that provision should be made in the implementation of FLHE to cover out-of-school children and the key affected populations such as the FSWs, MSMs and other groups. The Nigerian Broadcasting Commission, the agency in charge of monitoring media

transmission had banned all forms of pornographic films on local media stations including social media platforms in Nigeria[511]. The 2015 cybersecurity act in Nigeria also banned child pornography[512]. These laws would need to be enforced to reduce the circulation of sexually explicit movies among young people[511, 512]. Awareness creation in the communities through the engagement of community heads, religious organisations and opinion leaders as well as peer educators to discourage the use of telephone and other social media platforms to share or watch pornographic films in order to reduce the risk of sexual risk behaviours.

6.5.2. Need to invest in HPV vaccination in Nigeria

HPV vaccination is pivotal to the prevention of HPV associated morbidities, particularly, the associated cancers. First, it is necessary for the government to create awareness of HPV infection and its sequaelae as part of STI prevention programmes. The creation of awareness should involve the men, women and children in the community and the key affected population communities. Second, the high burden of HPV requires that in the Ministry of Health in Nigeria should invest in the purchase and distribution of the HPV vaccine. Worldwide, the most effective approach as regards the HPV vaccination programme is via schools [55, 513, 514]. Although vaccination of girls should be prioritised and quickly implemented on a national scale to achieve herd immunity, inclusion of boys will reduce the inequality and stigma associated with vaccinating girls alone [55, 513, 515]. However, Nigeria might need to modify this approach because of the high number of out of school children that will be eligible for HPV vaccination Two-third of the 10.5 million out of school children (5-14 years) in Nigeria are girls[516]. It is also essential to consider catch-up vaccinations for those who could have been sexually exposed at an early age and before the recommended age for HPV vaccination [517, 518].

6.5.3. Screening of other genital and anal sites?

The high prevalence of HPV and concomitant rate between anal and genital sites, particularly between cervical and anal HPV infections. This finding is suggestive of multiple sites HPV infection among sexually active women in the community. It is recommended that women with high intraepithelial neoplasia lesion of the cervix especially with HPV-16 should also be screened for anal lesions[519]. Anal cancer is rare in Nigeria with age standardised incidence

rate of 0.6 per 100,000 in women [158]. There is lack of data on anal dysplasia among women in Nigeria. However, a study in Abuja Nigeria among 424 MSM that were screened with anal cytology showed that 10.5% had low-grade squamous intraepithelial lesions while 6.3% had high-grade squamous intraepithelial lesions[520]. In the same study, two third of MSM with premalignant lesion of anal canal were HIV positive. Women with high-risk anal HPV, especially those infected HPV-16 and -18 should be monitored for any evidence of persistence infection with HPV DNA and anal cytology screening as first line methods and high resolution anoscopy as a second line. The cost effectiveness of population screening for anal premalignant lesions among women is yet to be ascertained. Recommendation to screen for anal premalignant lesions should be individualised based on risk factors and medical history.

6.5.4. More scientific evidence on the epidemiology of HPV in Nigeria

Due to the limitations associated with cross-sectional studies, it will be informative to conduct longitudinal studies among different age group of women to measure the incidence, clearance and persistence of HPV in the four anatomical sites. Inclusion of adolescent girls before they become sexually active and possibly acquire HPV in the study will provide information to guide in making decision for the appropriate age to introduce HPV vaccination in Nigeria. Information on the role of HPV vaccination will be important in future studies in order to understand the impact of the vaccine in the epidemiology of HPV in Nigeria. It will also be necessary to consider the inclusion of young adolescents that are less than 18 years, men, MSMs and other people of different sexual orientation. Further exploration of the diverse socio-cultural groups in Nigeria may add more information to the epidemiology of HPV.

6.6. CONCLUSION

This thesis has described the epidemiology of HPV infection among women and FSWs using data from both the qualitative and cross-sectional studies to determine and explain the observed high burden of HPV in each of the four anatomical sites – (cervix, vulva, anus and oral cavity) among women in the general population and FSWs in the brothels. The findings obtained by this thesis revealed that the prevalence of HPV is high. HPV-35 was found to be

the most prevalent HR-HPV in all the four anatomical sites in FSWs and in the cervical and vulvar sites of women in the general population. HPV 52 and HPV-51 were the most common HR-HPV genotypes detected in the anal and oral sites, respectively, among women in the community. The thesis also provided information on the meanings, interpretation and attitudes towards different sexual behaviours, including the possibility of under reporting of these behaviours. Young people of 18-25 years of age are particularly practicing different sexual behaviours and most of these sexual practices were learnt from watching pornographic films. The public health implications of these findings including recommendations covering the primary and secondary prevention strategies were discussed. A longitudinal study was recommended to further investigate the epidemiology and associated morbidities of HPV infections among females in Nigeria.

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ANNEXTURES

ANNEX 3.1: FGD TOPIC QUIDE QUESTIONS

GENERAL INSTRUCTIONS FOR THE MODERATOR

Before you start each session of the FGD, please ensure that following issues are addressed:

i. Make sure all the invited participants are seated and comfortable
ii. Start by welcoming them to the session
iii. Introduce yourself (name and your role in the project), and the note taker. Send round a data collection sheet to all participants to capture some of their demographic information.
iv. Ensure every participant consented to the FGD by checking their consent form or verbally verify from those that opted for oral consent.
v. Review the purpose of the FGD (i.e. the study objectives) and emphasise that we are hoping to learn from everyone through the discussion. Let them also know that the discussion is not about right or wrong answer or consensus; but every opinion is needed on issues that will be discussed.
vi. Set some ground rules by allowing the participants suggest these rules (examples are: respect all opinion, do not abuse, listen when others are talking, allow your colleagues to hear their view, turn off mobile phones or put in silent mode etc)
vii. Discuss other logistics such as location of the bathroom and refreshments. Tell them that the session will not exceed an hour
viii. Finally, confirm that everyone is happy with recording equipment; turn it on when you are ready to start the session.

SPECIFIC INSTRUCTIONS ON HOW TO MODERATE FGD

a. Give time for participants to think before answering your questions.
b. Do not rush to end discussion of questions, only move on to the next when you begin to hear repetition.
c. Ensure that everyone participate by moderating those that are domineering and encourage the quiet members to speak.
d. Try to generate further discussions with follow-up probes on issues that are not mentioned or that you think are not clearly discussed.
e. Summarise what you think are the key messages after each question has been exhaustively discussed, and ask participant again whether your summary captured their thought

FGD QUESTIONS

The following questions will guide the discussion in an open way.

1. Let us start with this question; how do people learn about sexual behaviours generally? Do the ways people learn these sexual behaviours differ?
    a. *Probe for sources of knowledge or information (friends/peers, family, religious group, TV/radio, Literature/school, internet or films etc)*
    b. *Probe whether sources of information might influence what type of sexual behaviour people learn*
    c. *How about you, how did you learn about oral/anal sex?*
2. What does oral sex mean to you?
    a. *Probe for when a man (boy) is giving oral sex to a woman (girl) (i.e. when a man use his mouth or tongue to touch the private part of a woman)*
    b. *Probe for when a woman (girl) is giving oral sex to a man (boy) (i.e. when a woman use her mouth or tongue to touch the penis of a man)*
    c. *Probe for same sex oral sex (i.e. man to man or woman to woman)*

3. What does anal sex mean to you?
    a. *Probe for when a man (boy) is giving anal sex to a woman (girl) (i.e. when a man put his penis inside the anus of a woman)*
    b. *Probe for when a man (boy) is giving anal sex to another man(boy) (i.e. when a man put his penis inside the anus of another man)*
4. People use different names (terms) to describe types of sexual behaviours in the community, and these names might have different meanings or interpretations. What are the various names (terms) including slang that are used to describe oral sex? (*Ascertain whether there is any difference between formal or local names, terms by health professionals and slang for oral sex)?*
    a. *Probe for when such names or slangs are usually used?*
    b. *Probe for how people feel when such names or slangs are used (acceptability) in the community?*
    c. *Probe for whether people understand the meaning of those names or slang when they are used to describe oral sex?*
    d. *Probe for which of these names (terms) that people will be happy to see in the questionnaire if we are to ask men or women about oral sexual behaviours in the community?*
5. Like I said earlier when we were talking about oral sex, people use different names (terms) to describe types of sexual behaviours, what are the various local names including slang that are used to describe anal sex? (*Ascertain whether there is any difference between formal or local names, terms by health professionals and slang for anal sex*)
    a. *Probe for when such names or slangs are usually used?*
    b. *Probe for how people feel when such names or slangs are used (acceptability) in the community? Probe: Might anyone find these terms offensive?*
    c. *Probe for whether people understand the meaning of those names or slangs when they are used to describe anal sex?*
    d. *Probe for which of these names (terms) that people will be happy to see in the questionnaire if we are to ask men or women about anal sexual behaviours in the community?*
6. What are the reasons why some people engage in oral or anal sex, and why others do not?
    a. *Probes for reasons e.g. because it is pleasureable, to avoid HIV, to avoid pregnancy, because they feel obliged or are forced, because they wish to do the same things as their friends report doing or because of money or benefit etc*
    b. *Probe for reasons for oral sex*
    c. *Probe for reasons tor anal sex*
7. We've talked about some of the reasons why people do or do not engage in different behaviours. Are there any other advantages or disadvantages, in your opinion?
    a. *Probe for oral sex*
    b. *Probe for anal sex*
    c. *Probe for risks if not covered in discussion so far*
    d. *Probe for knowledge of common sexually transmitted infections including human papillomavirus*

ANNEX 3.2: IDI TOPIC QUIDE QUESTIONS

GENERAL INSTRUCTIONS FOR THE INTERVIEWER

Before you start each IDI session, please ensure that following issues are addressed:

ix. Make sure the participant is comfortable with the venue
x. Thank and welcome participant to the session
xi. Introduce yourself (name and your role in the project). Ask the participant to fill in his or her demographic information into a data collection sheet (age, sex religion, ethnicity and marital status).
xii. Ensure that the participant consented (written or verbal depending on their choice)
xiii. Review the purpose of the IDI (i.e. the study objectives) and emphasise that we are hoping to learn from the participant's experience.
xiv. Finally, confirm that the participant is happy with the recording equipment; turn it on when you are ready to start the interview.

SPECIFIC INSTRUCTIONS ON HOW TO CONDUCT IDI

f. Give time for participant to think before answering your questions
g. Do not rush to move on to the next question until you begin to hear repetition
h. Try to generate further discussions with follow-up probes on issues that are not mentioned or that you think are not clearly discussed
i. Summarise what you think are the key messages after each question has been answered, and ask participant again whether your summary captured their thought

IDI QUESTIONS

The interview will involve structured and open questions on the following topics:

A.) GENERAL SEXUAL BEHAVIOUR QUESTIONS

8. Let me start with this question; how do people learn about sexual behaviours generally? Do the ways people learn these sexual behaviours differ?
    a. *Probe for sources of knowledge or information (friends/peers, family, religious group, TV/radio, Literature/school, internet or films etc)*
    b. *Probe whether sources of information might influence what type of sexual behaviour people learn*
    c. *How about you, how did you learn about oral, how did you learn about anal sex?*
9. What does oral sex mean to you?
    a. *Probe for when a man (boy) is giving oral sex to a woman (girl) (i.e. when a man use his mouth or tongue to touch the private part of a woman)*
    b. *Probe for when a woman (girl) is giving oral sex to a man (boy) (i.e. when a woman use her mouth or tongue to touch the penis of a man)*
    c. *Probe for same sex oral sex (either man to man or woman to woman)*
10. What does anal sex mean to you?
    c. *Probe for when a man (boy) is giving anal sex to a woman (girl) (i.e. when a man put his penis inside the anus of a woman)*
    d. *Probe for when a man (boy) is giving anal sex to another man(boy) (i.e. when a man put his penis inside the anus of another man)*

B.) SPECIFIC INTERVIEW GUIDE

<u>Only for those with previous oral sex experience</u> [*I will like to seek further clarifications on your experience about oral sex].*

11. In your opinion, what will you say are the reason(s) that motivates or make you avoid oral sex with your partner now?
    a. *Probe for fear of pregnancy*
    b. *Probe for perception of risk (may be its less riskier)*
    c. *Probe for partner pressure or transactional benefits (money or favour)*
12. Do you see any risks in having oral sex?
    a. *Probe for knowledge of any health risks (sexually transmitted infection; HIV and human papillomavirus etc)*
    b. *Probe for any previous experience (stigma, discrimination, injury etc)*

Only for those with previous anal sex experience

[*I will like to seek further clarifications on your experience about anal sex].*

13. In your opinion, what will you say are the reason(s) that motivates or make you avoid anal sex with your partner?
    a. *Probe for what motivated then, how about now?*
    b. *Probe for fear of pregnancy*
    c. *Probe for perception of risk (may be its less riskier)*
    d. *Probe for partner pressure or transactional benefits (money or favour)*
14. Do you see any risks in having anal sex?
    a. *Probe for knowledge of any health risks (sexually transmitted infection; HIV and human papillomavirus etc)*
    b. *Probe for any previous experience (stigma, discrimination, injury etc)*

ANNEX 3.3: INFORMATION SHEET AND INFORMED CONSENT FORM FOR FGD

Investigators: Dr. Imran O. Morhason-Bello, & Prof. Isaac F. Adewole

Organization: University of Ibadan

Sponsor: University of Ibadan

You are being invited to take part in a research study. Before you decide it is important for you to understand, why the research is being done and what it will involve. Please take time to read the following information carefully and to talk to others about the study, if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

1. What is the purpose of this study?
We think that sexual behaviour may be changing in Nigeria, and we would like to document this so we can develop policies and programmes that help people to have healthy lives in Nigeria. We will try to learn from your perceptions and understanding of different types of sexual behaviours from what you know, learn and practiced. We are conducting this study in men and women aged 18-45 years living in selected communities in Ibadan. This project is being undertaken in part fulfillment for the award of research degree (PhD) at the London School of Hygiene and Tropical Medicine, London.

2. Why have I been chosen?
We are inviting men and women who are 18-45 years living in selected communities in Ibadan to participate in this study. We have asked you to participate because you are an adult representative of people in your community/workplace and we hope that you can offer us some useful information about different sexual behaviours.

3. What will happen if I join this study?
We will ask you to join other people of the same age range and gender to participate as a group. The focus group will involve 6 – 10 participants. The discussion will be moderated by an experienced moderator who is of the same gender with you, and it will take an average time of 45 – 60 minutes. The discussion will be conducted in a private venue that is convenient to you and other members of the group.
The research team member will provide detailed explanation to all your questions and concerns regarding your participation in this study. After satisfactory explanation, you will be asked to sign or thumbprint on this consent form. You will also be asked if you mind that the discussion is recorded. The discussion will be casual and you will be encouraged to talk freely about anything you feel is related to the questions. We will be interviewing people for about three months on this subject. You will only be asked to participate in this study once, although a few people may be asked to attend an additional interview later.

4. Will I be paid to be in this study?
We will compensate you with 1000 naira (£3.5) as stipend for transport and time spent for participating in the focus group discussion. We will also give you light soft drink and biscuit after the discussion.

5. What are the risks or discomforts of the study?
You may feel shy or embarrassed by the questions that we will be asking you. You may decide to refuse to answer any question if you feel uncomfortable. To minimize the possibility of feeling embarrassed, our study has a trained staff member who will help you deal with any bad feelings or embarrassing questions. We do not think there are any other risks involved in your taking part in this study. However, if you do feel that you have suffered harm as a result of taking part in the study then you should discuss this with this principal investigator:
Dr. Imran Morhason-Bello, Department of Obstetrics and Gynaecology, College of Medicine, University College Hospital/University of Ibadan, Oritamefa, Ibadan. Tel:+2347034784402.

6. Are there any benefits to being in the study?
We will use the information gained to improve the quality of the large household survey we are planning to conduct at another community in Ibadan, Nigeria.

7. How will my privacy be protected?
We will do everything we can to protect your privacy while you participate in this study. The group discussion will be held in private place and will be led by a trained research team member. Your personal records (e.g. your name, or place of residence) will only be available to the staff involved in this study. The copy of the digital recording will not have your name attached to it. We will be preparing a report about this study and we may quote some of the words you tell us in the report. In this report any words that you have told us during the interviews will not have your name attached to them. To keep your information confidential all recordings and forms will be kept safe and locked in the principal investigator's office at the University College Hospital, Oritamefa, Ibadan. The signed consent form by you gives your permission that your records may be reviewed by the institutional review board (IRB) or institutional ethics committee (IEC) who protect the rights of human volunteers. However, no reports about this study will identify you in any way.

8. What will happen to the results of the research study?
We will analyse the results without including your name and any other information that could potentially breach your privacy. Findings from this study will be used to design questions that will be used in the survey that will plan to conduct immediately after this study. The result will also be presented for the defense of a PhD programme at the London School of Hygiene & Tropical Medicine, London. We will share our experience from the study by presenting our findings at conferences and submit to journals for scientific publication

9. What will happen if I don't want to carry on with the study?
Your participation in this study is voluntary. It is your choice whether you want to take part in the study or not. You can decide not to participate in the study at any time, even after you have given verbal consent or after we have signed on your behalf this written Informed Consent Form, or even during the group discussion. You do not have to give a reason for wanting to stop being part of the study.

10. What if something goes wrong?

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions. If you remain unhappy and wish to complain formally, you can do this through The Provost, College of Medicine, University College Hospital, Oritamefa, Ibadan, Oyo state. If you are harmed due to someone's negligence, then you may have grounds for a legal action. Regardless of this, if you wish to complain, or have any concerns about any aspect of the way you have been treated during the course of this study then you should immediately inform the Principal Investigator; Dr Imran Morhason-Bello, Department of Obstetrics and Gynaecology, College of Medicine, University College Hospital/University of Ibadan, Oritamefa, Ibadan. Tel:+2347034784402

10. Who is organizing and funding the research?
This research is being conducted as part of requirement for the award of PhD at the London School of Hygiene & Tropical Medicine, London. Funding for this research was provided by the management of University of Ibadan as part of scholarship award for the PhD programme.

11. Who has reviewed the study?
The research study has been approved by the ethics committees of the Oyo State Government, State Secretariat, Ibadan, University of Ibadan/University College Hospital, and the London School of Hygiene & Tropical Medicine, London. These committees make sure that the study is carried out in the safest way possible.

12. Who do I contact if I have any questions?

If you want to talk to anyone about this research study because you think you have not been treated fairly or think you have been hurt by joining the study, or you have any other questions about the study, you should contact the people below:

Dr Imran O. Morhason-Bello,
Department of Obstetrics and Gynaecology, College of Medicine, University College Hospital/University of Ibadan, Oritamefa Ibadan. Tel:+2347034784402

Professor Isaac F. Adewole
Gynecological Oncology Unit,Department of Obstetrics and Gynaecology
College of Medicine, University College Hospital/University of Ibadan, Oritamefa, Ibadan

If you have any questions about your rights as a research study participant, you can contact the following people:

1. Professor C Falade, Chair, University of Ibadan/University College Hospital, Ethics Committee, University College Hospital, Oritamefa, Ibadan, Oyo State.
   Telephone: +234 22 413 922

2. Director of Secondary Health Care, Chair, Oyo State Research Ethics Review Committee, State Secretariat, Ibadan, Oyo State.
   Telephone: +2348036555092

You will be given a copy of the information sheet and a signed consent form to keep.
Thank you for considering taking the time to read this sheet

INFORMED CONSENT FORM FOR FOCUSED GROUP DISCUSSION

Name of Principal Investigator: **Imran Morhason-Bello**

	Please initial box
1. I confirm that I have read and understand the participant information sheet dated 8th April 2016 (version 2.0.) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered fully.	
2. I understand that my participation is voluntary and I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.	
3. I understand that sections of my medical notes and data collected during the study may be looked at by responsible individuals from the London School of Hygiene & Tropical Medicine, the Oyo State research ethics review committee, and the University of Ibadan/University College Hospital Joint ethical committee research. I give permission for these individuals to access my records.	
4. I agree to take part in the above study.	

Name of Participant *(printed)*	Signature/Thumbprint	Date
Name of Person taking consent	Signature	Date
Principal Investigator	Signature	Date

The participant is unable to sign. As a witness, I confirm that all the information about the study was given and the participant consented to taking part.

Name of Impartial Witness *(if required)*	Signature	Date

ANNEX 3.4: INFORMATION SHEET AND INFORMED CONSENT FORM FOR IDI

Investigators: Dr. Imran O. Morhason-Bello & Prof. Isaac F. Adewole

Organization: University of Ibadan

Sponsor: University of Ibadan

You are being invited to take part in a research study. Before you decide it is important for you to understand, why the research is being done and what it will involve. Please take time to read the following information carefully and to talk to others about the study, if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

1. What is the purpose of this study?

We think that sexual behaviour may be changing in Nigeria, and we would like to document this so we can develop policies and programmes that help people to have healthy lives in Nigeria. We will try to learn from your perceptions and understanding of different types of sexual behaviours from what you know, learn and practiced.We are conducting this study in men and women aged 18-45 years living in selected communities in Ibadan. This project is being undertaken in part fulfilment for the award of research degree (PhD) at the London School of Hygiene and Tropical Medicine, London.

2. Why have I been chosen?

We are inviting men and women who are 18-45 years living in selected communities in Ibadan to participate in this study. We have asked you to participate because we want to learn from previous experience on any of the sexual behaviours and also your age is within our target population. We hope that you can offer us some useful information about different sexual behaviours.

3. What will happen if I join this study?

We will conduct an in-depth interview with you especially to learn from your previous experience on different types of sexual behaviours including oral and anal sex. The interviewer will be a trained and highly experienced person of the same gender with you. The interview will take an average time of 45 – 60 minutes. The interview will be conducted in a private venue that is convenient for you.The research team member (interviewer) will provide detailed explanation to all your questions and concerns regarding your participation in this study. After satisfactory explanation, you will be asked to sign or thumbprint on this consent form. You will also be asked if you mind that the interview is recorded. The interview will be casual and you will be encouraged to talk freely about anything you feel is related to the questions. We will be interviewing people for about three months on this subject. You will only be asked to participate in this study once.

4. Will I be paid to be in this study?

We will compensate you with 1000 naira (£3.5) as stipend for transport and time spent for participating in the in-depth interview. We will also provide for you soft drink and biscuit after the interview.

5. What are the risks or discomforts of the study?

You may feel shy or embarrassed by the questions that we will be asking you. You may decide to refuse to answer any question if you feel uncomfortable. To minimize the possibility of feeling embarrassed, our study has a trained staff member who will help you deal with any bad feelings or embarrassing questions. We do not think there are any other risks involved in your taking part in this study. However, if you do feel that you have suffered harm as a result of taking part in the study then you should discuss this with the principal investigator: Dr Imran

Morhason-Bello, Department of Obstetrics and Gynaecology, College of Medicine, University College Hospital/University of Ibadan, Oritamefa, Ibadan. Tel:+2347034784402

6. Are there any benefits to being in the study?
We will use the information gained to improve the quality of the large household survey we are planning to conduct at another community in Ibadan, Nigeria.

7. How will my privacy be protected?
We will do everything we can to protect your privacy while you participate in this study. The interview will be held in private place and will be conducted by a trained research team member. Your personal records (e.g. your name, or place of residence) will only be available to the staff involved in this study. The copy of the digital recording will not have your name attached to it. We will be preparing a report about this study and we may quote some of the words you tell us in the report. In this report any words that you have told us during the interviews will not have your name attached to them. To keep your information confidential all recordings and forms will be kept safe and locked in the principal investigator's office at the University College Hospital, Oritamefa, Ibadan.The signed consent form by you gives your permission that your records may be reviewed by the institutional review board (IRB) or institutional ethics committee (IEC) who protect the rights of human volunteers. However, no reports about this study will identify you in any way.

8. What will happen to the results of the research study?
We will analyse the results without including your name and any other information that could potentially breach your privacy. Findings from this study will be used to design questions that will be used in the household survey that we plan to conduct immediately in another community within Ibadan. The result will also be presented for the defense of a PhD programme at the London School of Hygiene & Tropical Medicine, London. We will share our experience from the study by presenting findings at conferences and submit to journals for scientific publication

9. What will happen if I don't want to carry on with the study?
Your participation in this study is entirely voluntary. It is your choice whether you want to take part in the study or not. You can decide not to participate in the study at any time, even after you have given verbal consent or after we have signed on your behalf this written Informed Consent Form, or even during the interview. You do not have to give a reason for wanting to stop being part of the study.

10. What if something goes wrong?

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions. If you remain unhappy and wish to complain formally, you can do this through The Provost, College of Medicine, University College Hospital, Oritamefa, Ibadan, Oyo state. If you are harmed due to someone's negligence, then you may have grounds for a legal action. Regardless of this, if you wish to complain, or have any concerns about any aspect of the way you have been treated during the course of this study then you should immediately inform the Principal Investigator; Dr Imran Morhason-Bello, Department of Obstetrics and Gynaecology, College of Medicine, University College Hospital/University of Ibadan, Oritamefa, Ibadan. Tel:+2347034784402.

10. Who is organizing and funding the research?
This research is being conducted as part of requirement for the award of PhD at the London School of Hygiene & Tropical Medicine, London. Funding for this research was provided by the management of University of Ibadan as part of scholarship award for the PhD programme.

11. Who has reviewed the study?

The research study has been approved by the ethics committees of the Oyo State Government, State Secretariat, Ibadan, University of Ibadan/University College Hospital, and the London School of Hygiene & Tropical Medicine, London. These committees make sure that the study is carried out in the safest way possible.

12. Who do I contact if I have any questions?

If you want to talk to anyone about this research study because you think you have not been treated fairly or think you have been hurt by joining the study, or you have any other questions about the study, you should contact the people below:

Dr Imran O. Morhason-Bello,
Department of Obstetrics and Gynaecology, College of Medicine, University College Hospital/University of Ibadan, Oritamefa Ibadan. Tel:+2347034784402

Professor Isaac F. Adewole
Gynecological Oncology Unit,Department of Obstetrics and Gynaecology
College of Medicine, University College Hospital/University of Ibadan, Oritamefa, Ibadan

If you have any questions about your rights as a research study participant, you can contact the following people:

1. Professor C Falade, Chair, University of Ibadan/University College Hospital, Ethics Committee, University College Hospital, Oritamefa, Ibadan, Oyo State.
   Telephone: +234 22 413 922

2. Director of Secondary Health Care, Chair, Oyo State Research Ethics Review Committee, State Secretariat, Ibadan, Oyo State.
   Telephone: +2348036555092

You will be given a copy of the information sheet and a signed consent form to keep.

Thank you for considering taking the time to read this sheet

INFORMED CONSENT FORM FOR IN-DEPTH INTERVIEW

Name of Principal Investigator: **Imran Morhason-Bello**

	Please initial box
1. I confirm that I have read and understand the participant information sheet dated 8th April 2016 (version 2.0) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered fully.	
2. I understand that my participation is voluntary and I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.	
3. I understand that sections of data collected during the study may be looked at by responsible individuals from the London School of Hygiene & Tropical Medicine, the Oyo State research ethics review committee, and the University of Ibadan/University College Hospital Joint ethical committee research. I give permission for these individuals to access my records..	
4. I agree to take part in the above study.	

Name of Participant *(printed)*	Signature/Thumbprint	Date
Name of Person taking consent	Signature	Date
Principal Investigator	Signature	Date

The participant is unable to sign. As a witness, I confirm that all the information about the study was given and the participant consented to taking part.

Name of Impartial Witness *(if required)*	Signature	Date

ANNEX 3.5: ETHICAL APPROVALS

TELEGRAMS.....

TELEPHONE.....

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. .....

All communications should be addressed to the Honorable Commissioner quoting

Our Ref. No. AD 13/479/518

Re: The Epidemiology of and risk factors for oro-genital and anal human papillomavirus infections among sexually active Nigerians: a mixed methods study,

The Principal Investigator: Dr. I. O. Morhason-Bello

Address: Department of Obsterics & Gynaecology,
Faculty of Clinical Sciences,
College of Medicine, University College Hospital, Ibadan, Nigeria

Date of receipt of application: 31st August, 2017

Status: **2nd Year Approval**

This is to inform you that the Oyo State Ethical Review Committee has received your application for renewal of approval on the above titled research. The report states that 35 females, 30 males and 10 female sex workers have been recruited for the focus group discussion (FGD) in Ibadan South East LGA. It also indicates that 7 females, 12 males and 2 female sex workers have been recruited for the In-depth Interview (IDI) in Ibadan South East LGA. The report does not indicate any adverse effect.

The Committee notes the contents of the report and having found it satisfactory, hereby approves the protocol **version 3.0 dated** 01/08/2017 for renewal of approval for **one year of study only.**

The renewed approval dates from **31/08/2017 to 30/08/2018.** Note that no participants accrual or activity related to this research may be conducted outside of these dates

Please note that the National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations, in line with this, the Committee will monitor closely and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of findings as this will help in policy making in the health sector.

Wishing you all the best.

[redacted]

Dr. Abbas Gbolahan
Director, Planning, Research & Statistics
Secretary, Oyo State, Research Ethical Review Committee

INSTITUTE FOR ADVANCED MEDICAL RESEARCH AND TRAINING (IAMRAT)
College of Medicine, University of Ibadan, Ibadan, Nigeria.

Director: **Prof. Catherine O. Falade,** *MBBS (Ib), M.Sc, FMCP, FWACP*
Tel: 0803 326 4593, 0802 360 9151
e-mail: cfalade@comui.edu.ng lillyfunke@yahoo.com

UI/UCH EC Registration Number: **NHREC/05/01/2008a**

NOTICE OF FULL APPROVAL AFTER FULL COMMITTEE REVIEW

Re: The Epidemiology of and Risk Factors for Oro-genital and Anal Human Papillomavirus infections among Sexually Active Nigerians: A Mixed-Methods Study

UI/UCH Ethics Committee assigned number: UI/EC/16/0005

Name of Principal Investigator: **Dr. I. O. Morhason-Bello**

Address of Principal Investigator: Department of Obstetrics & Gynaecology, College of Medicine, University of Ibadan, Ibadan, Nigeria

Date of receipt of valid application: 07/01/2016

Date of meeting when final determination on ethical approval was made: **N/A**

This is to inform you that the research described in the submitted protocol, the consent forms, and other participant information materials have been reviewed and *given full approval by the UI/UCH Ethics Committee.*

This approval dates from **05/04/2016 to 04/04/2017.** If there is delay in starting the research, please inform the UI/UCH Ethics Committee so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the* UI/UCH EC *assigned number and duration of* UI/UCH EC *approval of the study.* It is expected that you submit your annual report as well as an annual request for the project renewal to the UI/UCH EC early in order to obtain renewal of your approval to avoid disruption of your research.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the UI/UCH EC. *No changes are permitted in the research without prior approval by the* UI/UCH EC *except in circumstances outlined in the Code. The* UI/UCH EC *reserves the right to conduct compliance visit to your research site without previous notification.*

UI/UCH EC [redacted] COLLEGE OF MEDICINE, U.I.

Professor Catherine O. Falade
Director, IAMRAT
Chairperson, UI/UCH Ethics Committee
E-mail: uiuchec@gmail.com

London School of Hygiene & Tropical Medicine
Keppel Street, London WC1E 7HT
United Kingdom
Switchboard: +44 (0)20 7636 8636

www.lshtm.ac.uk

Research Ethics Committee

Mr Imran Morhason-Bello
2 October 2017

Dear Imran,

Study Title: The epidemiology of and risk factors for oro-genital and anal human papillomavirus infections among sexually active Nigerians: A mixed methods study

LSHTM MSc Ethics ref: 9736 - 2

Thank you for submitting your amendment for the above research project.

Your amendment has been assessed by the Research Governance & Integrity Office and has been approved as a non-substantial change. The amendment does not require further ethical approval from the observational ethics committee.

List of documents reviewed:

Document Type	File Name	Date	Version
Other	SHINI PROJECT study protocol_v3.0Tracked	01/08/2017	3
Other	Annexes_v3.0Tracked	01/08/2017	3
Other	UI:UCH Amendment Approvalv3.0_2017	01/08/2017	1
Other	UI:UCH_Renewal of Ethical Approval_2017	01/08/2017	1
Other	Oyo State Ammendement ApprovalV3.0_2017	01/08/2017	1
Other	Oyo State_Renewal of Ethical approval_2017	01/08/2017	1
Other	LSHTM_Update Report and Renewal request for ethical approval	01/08/2017	1
Other	LSHTM_Letter of Amendment_August 2017	01/08/2017	1
Covering Letter	LSHTM_Query covering Letter_Sept2017	01/09/2017	v1.0
Other	LSHTM_Letter of Ammendement Sept_2017_Revised	01/09/2017	2

Any subsequent changes to the application must be submitted to the Committee via an Amendment form on the ethics online applications website: http://leo.lshtm.ac.uk/ .

Best of luck with your project.

Yours sincerely,

[redacted]

Rebecca Carter

Research Governance Coordinator

Ethics@lshtm.ac.uk
http://www.lshtm.ac.uk/ethics/

Improving health worldwide

ANNEX 4.1: INFORMATION SHEET AND INFORMED CONSENT FORM FOR CROSS-SECTIONAL STUDY

Investigators: Dr. Imran O. Morhason-Bello & Prof Rasheed Bakare

Organization: University of Ibadan

Sponsor: University of Ibadan

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and to talk to others about the study if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

1. What is the purpose of the study?

The purpose of this research is to learn about different types of sexual behaviours and how these behaviours make it easier or harder to become infected with infections such as human Immunodeficiency virus (HIV) and human papillomavirus (HPV) infections. You may have heard about infection that could occur during sexual activity without any protection between two people. These are called sexually transmitted infections. HIV and HPV are common examples of sexually transmitted infections. HPV infection is an infection that can cause cancer of the cervix, vagina, vulva, anus, mouth and throat in women. It can also cause cancer of penis, anus, mouth and throat in men. HPV infections do not present with any symptoms and this infection may go on in the body without any knowledge of it. We think that sexual behaviour may be changing in Nigeria, and we do not know whether these changes could make it easier or harder to get human papillomavirus infection. We would like to document this so that we can better develop policies and programme that help people to have healthy lives in Nigeria. The information gathered will also assist us to have knowledge on how to prevent and treat any health-related problems that are identified. We are conducting this study in men and women aged 18-45 years living in selected communities in Ibadan. This project is being undertaken in part fulfilment for the award of research degree (PhD) at the London School of Hygiene and Tropical Medicine, London.

2. Why have I been chosen?

Men and women who are 18-45 years living in selected communities within Ibadan are expected to participate in this study. Pregnant women or recently delivered mothers (less than 6weeks after childbirth) will not be able to participate. At each selected community, we will first randomly select houses. Thereafter, we will then randomly select from list of men and women who are 18-45years living selected houses. You are not selected because we have any information about you or that you may have human papillomavirus infection. Participation in the study involves face-to-face interview by a member of our research team (same gender with you) and collection of some samples by the research nurse. |For men, we will collect samples from the mouth, penis and anus. Samples from women will be collected from mouth, cervix, vulva, and anus. Samples will be collected in the clinic by an experienced research nurse. Your decision to participate means you have understood every aspect of the study and agree for interview and samples collection. We will be enrolling 900 individuals to participate in the study from different communities.

3. What will happen if I join this study?

If you chose to participate we will ask you sign a consent form to confirm this decision. Thereafter, you will be interviewed, and some samples will be collected from you either at where you live, or clinic located close to your environment. We will collect contact details from you and seek date and time that is convenient for you between 8.00 – 16.00hours any day of the week to participate in the study.

On the day of the appointment, members of our research team will visit you. During this visit, you will be required to participate in some activities which will be coordinated by our research team. First, you will be asked some questions by a member of the research team on awareness, knowledge and practice of sexual behaviours. Some of these questions may sound very personal and sometimes sensitive. We will appreciate if you could answer in a very honest way. After this interview, the second activity is collection of some samples. These samples will be collected from your blood, mouth, private parts and anus. A trained nurse will collect these samples after explaining in detail the procedures. The blood test is to check for your HIV status and this will involve collecting about 5 ml of blood from your arm into a bottle that is labelled with a specific code. This code will make the research team identify each sample. A rapid HIV test will be performed. Everyone will be given their result of rapid HIV test before leaving the clinic. Anyone that is HIV positive according to the national guidelines will be referred to treatment site for a repeat test and care. However, if a person does decide s/he does not want to know their HIV test results, we will collect their blood sample for anonymous rapid HIV testing (the result will not be linked to the individual). After this, the nurse will collect samples from other sites using a small stick with cotton tip (Dacron swabs) placed into separate sample bottles. The Dacron swab is safe, and it will not cause any pain to you apart from little discomfort during insertion especially into your anus. If the nurse noticed any sign of sexually transmitted infections (STI), such individual will be offered treatment according to the symptoms and signs (syndromic management of STIs). If you want at the end, the nurse will check your pulse rate, blood pressure and test your urine for protein and sugar. The essence is to screen you for other medical conditions which are often neglected. If the result shows any abnormal result, the nurse will counsel you and refer you to see any health care provider of your choice. Everyone that participated in the research will be informed about the result of tests conducted. We will deliver the result through our research team personally to you in a sealed envelope which will not contain your personal details. For those that will be required to see us due to the nature of their result, we will include date, time and venue of such appointment.

4. What will the research team do with my blood and swabs samples?

The oral rinse samples, blood and swabs samples will be taken to the minus 80-degree freezer at the University College of Hospital for storage. We will use the blood to do HIV test and swabs from the mouth, private part and anus will be tested for human papillomavirus infection. Frozen oral rinse and dacron swabs from private parts and anus will be taken to Catalan Institute for Oncology in Barcelona Spain for storage and HPV DNA testing. The left-over sample will be used for future studies that will examine different infections at these sites.

5. Will it cost me anything to be in this study?

You will not pay any money for participation and all screening as well a possible treatment for those that will require such is free.

6. Will I be paid to be in this study?

We will compensate you with 1000 naira (£3.5) as stipend for transport and time spent for participating in all stages of the study. We will also give you an item from some of these health-related incentives – soap, tooth paste and brush, and a soft drink and biscuit refreshment after sample collection.

7. What are the risks or discomforts of the study?

There is no any envisaged physical injury for participating in this study aside discomfort of needle stick pain and during introduction of swab stick into your anal cavity. However, you may feel embarrassed by answering some of the interview questions on sexual behaviour. We have a team of trained research staff that will support you and they will reassure you that your response will be kept confidential. We are only collecting a small amount of blood from you. Most people do not have any problems after having a blood test but you may feel a slight pain or faintness when the blood is taken. Occasionally pain and bruising may occur where the needle goes into your arm but this is very unusual. You may also feel embarrassed or uncomfortable during the genital

examination and sample collection. For women, you may feel slightly uncomfortable when speculum is passed into your private part for genital (cervix) sample collection may associated with some slight disc. There is no any envisaged problems with other sample collection methods. In the event that your samples shows a positive result for either HIV or HPV infection, this could make you to be unhappy and possibly get upset. Our staff will show understanding and further counsel you on the next line of action including linking you treatment center.

8. Are there any benefits to being in the study?

The following might be of benefit to you if you participate in the study:
(1) You will have free HIV and HPV infection testing with follow-up counseling
(2) You will be offered free treatment if there is any evidence of sexually transmitted infection
(3) We will provide screening and counseling for some common non-communicable diseases through urine testing for protein and glucose, and checking of your vital signs (Pulse and Blood pressure)
(4) You will also be able to ask question on any health-related question and possible advice from the study nurse.
If you decide to take part in the study, it will help us to understand different sexual behaviour. We hope that this will help us to develop better ways to protect people HIV and other sexually transmitted infections.

9. How will my privacy be protected?

We assure you that everything possible will be done to protect your privacy including linking your information with you. To guide against any breach of your privacy, we will conduct interview and examination in a private room. There will be no name in the data collection form and result sheets that will be brought to the point of interview. However, we will have your name and mobile number on a separate register to contact you when the results of various tests are ready. Only selected members of the research team involve with this will have access to this personal information. All documents related to this study will be kept safe and locked in the principal investigator's office at the University College Hospital, Oritamefa, Ibadan.

10. What will happen to the results of the research study?

We will analyse the results without including your name and any other information that could potentially breach your privacy. Your test results will be given to you in a sealed envelope. If you need follow-up counselling or care, we will make arrangement with you for other necessary service. The result will also be presented for the defense of a PhD programme at the London School of Hygiene & Tropical Medicine, London. We will share our experience from the study by presenting our findings at conferences and submit to journals for scientific publication.

11. What will happen if I don't want to carry on with the study?

You do not have to join as your participation is entirely voluntary. If you choose to participate, you will be required to sign a consent form before our research team can proceed. However, if you decided not to participate at any stage of the study, we will respect this decision and terminates the study with you.

12. What if something goes wrong?

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions. If you remain unhappy and wish to complain formally you can do this through The Provost, College of Medicine, University College Hospital, Oritamefa, Ibadan, Oyo state. If you are harmed due to someone's negligence, then you may have grounds for a legal action. Regardless of this, if you wish to complain, or have any concerns about any aspect of the way you have been treated during the course of this study then you should immediately inform the Principal Investigator; Dr Imran Morhason-Bello, Department of Obstetrics and Gynaecology, College of Medicine, University College Hospital/University of Ibadan, Oritamefa, Ibadan. Tel:+2347034784402

13. Who is organising and funding the research?

This research is being conducted as part of requirement for the award of PhD at the London School of Hygiene & Tropical Medicine, London. Funding for this research was provided by the management of University of Ibadan as part of scholarship award for the PhD programme.

14. Who has reviewed the study?

The research study has been approved by the ethics committees of the Oyo State Government, State Secretariat, Ibadan, University of Ibadan/University College Hospital, and the London School of Hygiene & Tropical Medicine, London. These committees make sure that the study is carried out in the safest way possible.

15. Who do I contact if I have any questions?

Please feel free to talk to any of the following people in the event of any unsatisfactory conduct of our research team members towards you.
You can speak to:
Dr Imran O. Morhason-Bello,
Department of Obstetrics and Gynaecology,
College of Medicine, University College Hospital/University of Ibadan, Oritamefa Ibadan. Tel:+2347034784402

Professor Rasheed Bakare,
Department of Medical Microbiology,
College of Medicine, University College Hospital/University of Ibadan, Oritamefa, Ibadan

If you have any questions about your rights as a research study participant, you can contact the following people:
Professor C Falade, Chair, University of Ibadan/University College Hospital, Ethics Committee, University College Hospital, Oritamefa, Ibadan, Oyo State.

Telephone: +234 22 413 922
Director of Secondary Health Care, Chair, Oyo State Research Ethics Review Committee, State Secretariat, Ibadan, Oyo State.
Telephone: +2348036555092

INFORMED CONSENT FORM FOR CROSS-SECTIONAL STUDY

Name of Principal Investigator: Imran Morhason-Bello

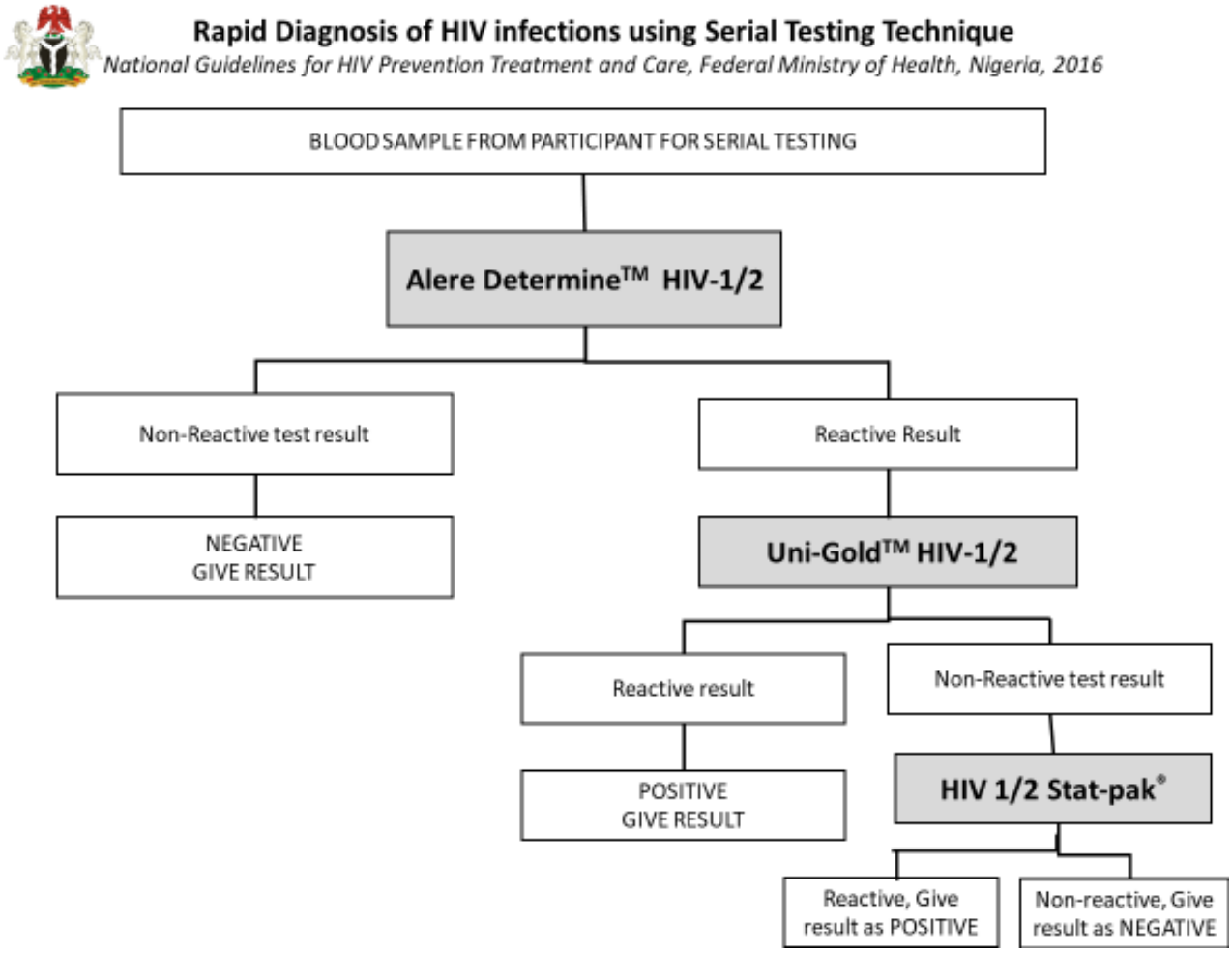
1. I confirm that I have read and understand the participant information sheet dated 20th March 2018 (version 4.0) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered fully.	
2. I understand that my participation is voluntary, and I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.	
3. I understand that sections of my medical notes and data collected during the study may be looked at by responsible individuals from the London School of Hygiene & Tropical Medicine, the Oyo State research ethics review committee, and the University of Ibadan/University College Hospital Joint ethical committee research. I give permission for these individuals to access my records.	
4. I agree for my photo/quote/recording/other to be used in the publication or report released on the study.	
5. I agree for any remaining tissue samples to be retained, stored at SHINI laboratory, Ibadan, and used for future research, subject to further ethical approval	
6. I agree to take part in the above study.	

Name of Participant *(printed)*	Signature/Thumbprint	Date
Name of Person taking consent	Signature	Date
Principal Investigator	Signature	Date

The participant is unable to sign. As a witness, I confirm that all the information about the study was given and the participant consented to taking part.

Name of Impartial Witness *(if required)*	Signature	Date

ANNEX 4.2: RDT HIV SERIAL TESTING



FEMALE
CASE REPORT FORM

Sexual Behaviour and HPV Infection In Nigerians In Ibadan (SHINI) Project

[Version 5.0_April 2018]

SECTION 0: INTERVIEWER AND PARTICIPANT INFORMATION

	QUESTIONS AND FILTERS	RESPONSE COLUMN
Q001 doi	Date of interview *[Write the date in days/month/year]*	|___|___| |___|___||___|___|___|___| DD MM YYYY
Q002 rasin	Research assistant initials *[Write your 3 digits initials in upper case in the box]*	|___|___|___|
Q003 hwin	Healthworker's initials *[Write your 3 digits initials in upper case in the box]*	|___|___|___|
Q004 qccin	Quality Control Checker initials *[Write your 3 digits initials in upper case in the box]*	|___|___|___|
Q005 lga	Local government area code *[Check the code guide that was provided to identify the appropriate code for the LGA] [Write the 3 digits code for the LGA in the box]*	|___|___|___|
Q006 com	Community code *[Check the code guide that was provided to identify the appropriate code for the community] [Write the 3 digits code for the community in the box]*	|___|___|___|
Q007 ea	Enumeration area *[Check the code guide that was provided to identify the appropriate code for the EA] [Write the 4 digits code for the EA in the box]*	|___|___|___|___|
Q008 hid	House identification number *[Check the code guide that was provided to identify the appropriate house ID number] [Write the 4 digits code for the house ID in the box]*	|___|___|___|___|
Q009 ts	Time interview begin *[Write in hours minutes]*	|___|___| |___|___|

SECTION 1: BACKGROUND CHARACTERISTICS

READ: *Thank you very much for sharing your time to participate in this study. There are different sections in this interview. We implore you to be transparent and honest in your response to questions asked. I will read through each question and wait for your response. Please take as long as you need to remember or think about your answer. If a question is unclear, please ask me to repeat or explain it. Again, I will like to assure you that your response/answers are confidential, and they will not be traceable to you. I will start the interview by asking you some questions about yourself.*

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q101 dob	Please tell me your date of birth **[Ejowo e so fun mi ojo ibi yin?]** *[If participant can not remember; use the common local events/activity to estimate the nearest year. If participant can not remember the dates and month use the middate of the month for the expected date (15th) and mid-month of the year for the expected month (June)]* *[Record in Date/Month/Year]*	|___|___| |___|___||___|___|___|___| DD MM YYYY **[Ojo] [Osu] [Odun]**		
Q102 age aggrp	How old were you at your last birthday? **[Omo odun melo ni yin?]** *[Assist participant in estimating best answer by using common local events/activity in the area]*	Age in completed years **[Ojo ori ni pipe]** Don't know **[Nko mo] = 88**	|___|___|	
Q103 cityborn	Where were you born? **[Nibo ni a bi o si?]** *[If the age of the participant is < 18years, explain to her that she is not eligible and terminate the interview. Write the code for the response in the box]*	Ibadan = **01** **[Ibadan]** Other town in Oyo state = **02** **[Ilu miiran ni ipinle oyo]** Town outside Oyo state, but in Nigeria = **03** **[Ilu miiran ti kii se Ipinle oyo sugbon ni naijiria]** Town outside Nigeria = **04** **[Ilu lehin odi]** Don't know **[Nko mo]** = **88**	|___|___|	
Q104 fsch	Have you ever attended a formal school?**[N je oti losi ile iwe ri?]** *[Write the code for the response in the box]*	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	→ |___|___|	***If 02 skip to Q107***

Q105 schname	What is the highest level of formal school you have completed? **[Iwe melo ni o ka?]** *[Only one response is required] [Write the code for the response in the box]*	Some Primary = **01** **[Iwe alakobere die]** Completed Primary= **02** **[Alakobere]** Junior Secondary or some secondary = **03** **[Iwe girama kekere]** Completed Senior Secondary/High School= **04** **[Iwe girama agba]** Any Tertiary Education = **05** **[Iwe giga eyikeyi**]	|____|____|	
Q106 schlyr	How many years of formal education have you completed up till now? **[Odun melo ni oti fi kawe titi di akoko yii?]** *[Assist participant to calculate number of completed years]*	Indicate number of years completed **[Daruko iye odun ti o fi kawe]**	|____|____|	
Q107 quransch	Did you ever attend a Quranic school at all? [Nje o losi ile kehu ri?]*[Write the code for the response in the box]*	Yes [Beeni] = 01 No [Beeko] = 02	|____|____|	
Q108 liveyr	How long have you lived in this community or area?**[Bi odun melo ni o ti ngbe ni adugbo tabi agbegbe yii?]***[Assist participant to calculate number of completed years]*	*Indicate number of years* **[Daruko iye odun]** Record '00' If less than 1 year **[Ko '00' ti ko ba to odun kan]**	|____|____|	
Q109 relgrp relgrpsp	What is your religion?**[Esin wo ni o n sin? Tabi kini esin re?]** *[Write the code for the response in the box]*	None **[Ko si]** = **00** Christian **[Omoleyin jesu]** = **01** Islam **[Musulumi]** = **02** Traditional **[Elesin abalaye]** = **03** Other, *specify* **[Omiiran, salaye]** _____= **04**	|____|____|	
Q110 ethngrp ethngrpnsp ethngrpnnsp	What is your ethnic group? **[Eya wo ni o?]** *[Write the code for the response in the box]*	Hausa/Fulani **[Awusa/Fulani]** = **01** Igbo **[Ibo]** = **02** Yoruba **[Yoruba]** = **03** Other Nigerian, *specify* **[Eya miiran ni naijiria jo mo**] __ =**04** Non-Nigerian,*specify* **[Ajeji]**_____ = **05**	|____|____|	
Q111 marstat marstatsp	Which of these categories best describes your marital status at the moment? **[Ewo ninu awon ipele wonyi ni o salaye ni o salaye igbeyawo re?]** ***[****Prompt by reading each option for the participant. Write the code for the response in the box]*	Single (no current partner) = **01** **[Omidan (ti ko ti loko tabi ni olubadore)]** Single (Has boyfriend/lover but not living together) = **02** **Omidan (ti ko ti loko ti ko gbe plu olubadore)]** Single (living with a boyfriend/lover**)** = **03** **[Omidan ti ko ti loko, gbe pelu ololufe re)**] Currently married = **04** **[Sese loko]** Divorced = **05** **[Mo ti pinya pelu oko mi]** Widowed = **06 [Opo]** Separated= **07** **[Dalemosu]** Other, s*pecify* **[Omiran, salaye]** _____= **08**	|____|____|	
Q112 occp occpgrp occpsp	What is your current occupation? **[Iru ise wo ni o nse**] *[Classify the occupation after participant has responded. Write the code for the response in the box]*	Name of the occupation **[Oruko ise]** _____ Student = **01** **[Omo ile-iwe/akeko]** No current paid job [e.g.housewife] = **02** **[Mi o nise ti on mun owo wole]** Unskilled workers [Messenger/Food Vendors/) = **03** **[Ise ti a ko(ojise/olounje)]** Semi-skilled worker [e.g. Drivers/catering/ food vendor/Tailor/hairdresser /Trader) = **04** **[onise owo (awako,aranso,aserunloso,olutaja)]** Skilled worker Teacher/Technicians] = **05** **[akosemose oluko/onimo kekere]** Highly skilled worker [e.g.Doctor/Lawyer/ Engineer/ Accountant] = **06** **[onimo ijinle(apeer dokita,agbaejoro,onimo ero agba,olusiro owo]** Armed forces (military/police etc) = **07** **[omo ologun/olopa ati beebee lo]** Other, *specify* **[omiiran, salaye]** _____ = **08**	|____|____|	

Q113 income	What is your average income per month after tax?**[Elo lo n wole fun o losu leyin owo ori?]** *[Assist participant to calculate in Naira]*	Monthly income (Naira) **[Owo osu(naira**]: |___|___|___|___|___|___|___|		
Q114 phone	Do you own a mobile telephone? **[N je o ni ero ibanisoro Alagbeka?]***[Write the code for the response in the box]*	Yes **[Beeni]= 01** No**[Beeko]= 02**	|___|___|	
Q115 tv	Do you own a television? **[N je o ni eromohunmaworan?]** *[Write the code for the response in the box]*	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	
Q116 rad	Do you own a radio?**[N je o ni ero asoromagbesi(redio)?]** *[Write the code for the response in the box]*	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	
Q117 gentor	Do you own a generator? **[N je o ni ero amunawa?]***[Write the code for the response in the box]*	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	
Q118 hose	Do you own your own house? **[N je o ni ile ti ara re?]** *[Write the code for the response in the box]*	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	

SECTION 2: ALCOHOL, SMOKING, LOCAL STIMULANTS AND ILLICIT DRUG USE

READ: I am going to ask you some questions about your use of alcohol, tobacco, and other drugs. Thank you.

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q201 alcohol	Recall in your whole life up till now, have you ever drunk alcohol?**[Mofe ki o se iranti boya o ti mu oti lile ri?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___| →	**If 02 Skip to Q205**
Q202 auditoften	How often do you have a drink containing alcohol? **[Bawo ni o se maa nmu oti lile si?]** [Allow the participant to state the frequency and if you are unsure, probe for each option. Write the code for the response in the box]	Never **[rara]** = **00** Monthly or less **[osoosu tabi din]** = **01** 2-4 times per month **[emeji si emerin losu]** = **02** 2-3 times per week **[emeji si meta lose]** = **03** 4 or more times per week **[emerin tabi jube lo lose]** = **04**	|___|___|	
Q203 auditno	How many units of alcohol do you drink on a typical day when you are drinking?**[O maa nto bii igo oti melo ti o maa n mu lojumo?]** [Allow the participant to state the number of units, and if you are unsure, probe further. Write the code for the response in the box] [Half pint is equal to a bottle of beer or alcohol]	1-2 **[Eyokan si meji]** = **00** 3-4 **[Meta si merin]** = **01** 5-6 **[Marun si mefa]** = **02** 7-9 **[Meje si mesan]** = **03** 10+ **[Mewa tabi jube lo]** = **04**	|___|___|	
Q204 auditsix	How often have you had 6 or more units of alcohol on a single occasion in the last year?[Bawo ni e se nmu bii igo mefa tabi jube lo ni ijoko ekan ni odun ti o koja si?] [Allow the participant to state the frequency and if you are unsure, probe for each option. Write the code for the response in the box]	Never [Rara] = 00 Less than a month [Odin ni osu] = 01 Monthly [Ososu] = 02 Weekly [Osose] = 03 Daily or almost daily [Lojojumo] = 04	|___|___|	
Q205 tobco	In your whole life up to now, have you ever smoked cigarettes or any locally made tobacco? **[Lati igba ti e ti daye titi di akoko yi, n je e ti mu siga ri tabi taba ti ibile ri?]** [Allow the participant to state the frequency and if you are unsure, probe for each option. Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___| →	**If 02 Skip to Q207**

Q206 frtobco	How often do you smoke now? **[Bawo ni o se maa n mu siga si?]**[Allow the participant to state the frequency and if you are unsure, probe for each option. Write the code for the response in the box]	Daily **= 01** **[Lojojumo]** Less than daily, but regularly= **02** **[Ko ki n se ojojumo sugbon o wopo]** Occasionaly [e.g. special occasions] = **03** **[Ni ekokan(fun apeere nigbati o se Pataki bi ayeye)]** Not at all **[Rara]**= **04**	|___|___|	
Q207 eversnif evermar everher evercoc everglu everpeth everpent everamp evercod everroch evertram evershi everothe everdrgsp	Some people have tried a range of different types of substance (drugs), which of the following, if any, have you ever used when it was not prescribed by a medical person?**[Awon kan ti gbinyanju lati lo oniruru oogun,ewo ninu awon wonyi ti o ba wa ni o ti lo nigbati osise.ilera ko ko fun o pe ki o lo?]** [Please read out each of these substances and ask if she is taking any of them. Wirte **"01" for YES** and **"02" for NO**; Multiple responses are possible]	Snuff (Ifinmu) **[Sinofu]** Marijuana (weed) **[Igbo]** Heroine **[Eroin]** Cocaine **[Kokeni]** Glue/Gum**[Gulu]** Pethidine **[Petidin]** Pentazocine(Fortwin) **[Petasosin]** Amphetamines **[Amafetamin]** Codeine **[Kodini]** Rochi(Rophynol) **[Rosi]** Tramadol **[Tiramado]** Shisha [**shisha**] Other, specify**[Omiiran, salaye]**_____	|___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___|	**~~If 02~~ to all Skip to Q301**
Q208 threersnif threemar threeher threecoc threeglu threepeth threepent threeamp threecod threeroch threetram threeshi threeothe threedrgsp	Have you used any of these substances or drugs in the last 3 months when you did not need them medically? **[Nje o ti lo eyikeyi ninu awon oogun yii nigbati ilera re ko nilo re?]** [Please read out each of these substances and ask if she is taking any of them. Wirte **"01" for YES** and **"02" for NO**; Multiple responses are possible]	Sniff (Ifinmu **[Sinofu]** Marihuana (weed) **[Igbo]** Heroine**[Eroin]** Cocaine**[Kokeni]** Glue/Gum**[Gulu]** Pethidine**[Petidin]** Pentazocine(Fortwin) **[Petasosin]** Amphetamines**[Amafetamin]** Codeine**[Kodini]** Rochi(Rophynol) **[Rosi]** Tramadol**[Tiramado]** Shisha [**shisha**] Other, specify**[Omiiran, salaye]**_____	|___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___|	

SECTION 3: HUMAN PAPILLOMAVIRUS INFECTION

READ: I will now ask you some specific questions to understand your knowledge about the infection called "human papillomavirus"

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q301 hpvknw	Before we told you about this infection, had you ever heard of the infection called "human papillomavirus"? **[Ki a to so fun o nipa kokoro papilloma yii , nje o ti gbo nipa re ri?]**[Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	**If 02 Skip to Q401** →
Q302 hpvloc hpvlocsp	Where did you first hear about human papillomavirus infection? **[Nibo ni oti koko gbo nipa kokoro papilloma?]**[If participant did not mention any of the options, probe for it. Write the code for the response in the box]	Hospital or clinic= **01** **[Ile-iwosan]** Media (TV/Radio/Newspaper/Magazine) = **02** **[Lori ero mohunmaworan/asoro ma gbesi/iwe iroyin]** Internet= **03** **[Lori ero ayelukara]** Friends/peer= **04** **[Ore/akegbe]** Other, specify **[Omiiran, salaye]**_____ = **05** Can't remember **[Mi o le ranti]** = **77**	|___|___|	
Q303 hpvcatchas hpvcatchos hpvcatchvs hpvcatchds hpvcatchts hpvcatchga hpvcatchta hpvcatchother hpvcatchsp	Do you know how people catch human papillomavirus infection? **[N je o mo bii awon eeyan se maa nko kokoro papilloma yii?]** [Please read out each of these options and ask if she knows any of them. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	Through anal sex**[Ibi iho ile igbonse]** Through oral sex**[Ibalopo lati enu]** Through Vaginal sex **[Ibalopo lati oju ara**] Touching a dirty surface **[Fifi owo kan ibi ti o doti]** Touching a toilet seat **[Fifi owo kana wo ijoko ile igbonse]** After touching the genital area **[Leyin fifi own kan ayika oju ara**] After touching the anus **[Leyin fifi ow obo idi]** Other, specify **[Omiiran, salaye]**_____	|___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___|	

Q304 hpvcc hpvvc hpvoc hpvanc hpvhnc hpvabc hpvbc hpvpc hpvvlw hpvvaw hpvanw	Do you know what diseases are associated with human papillomavirus infection? **[Nje o mo awon arun ti o romo kokoro papilloma?]**[Please read out each of these options and ask if she knows any of them. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	Cervical cancer **[jejere enu ile omo]** Vulva cancer**[Jejere oju ara]** Oral (mouth/throat) cancer **[Jejere ona ofun/enu]** Anal cancer **[Jejere idi]** Head and neck cancer **[Jejere ori ati orun]** Abdominal cancer **[Jejere inu]** Blood cancer **[Jejere eje]** Vulva/vaginal/anal Warts **[Kokoro oju ara]**	|___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___|	
Q305 hpvprabs hpvprcas hpvpronep hpvprmsp hpvprvac hpvprbt hpvprmb hpvprant hpvprbm hpvprwvs hpvproth hpvprsp	Do you know whether any of these actions could prevent people from catching human papillomavirus infections? **[Nje o mo boya eyikeyi ninu awon igbese yii le dena nini kokoro papilloma?]** [Please read out each of these options and ask if she knows any of them. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	Abstain from sex **[Yiyera fun ibalopo]** Use condom during casual sex **[Liloroba idabobo lasiko ibalopo]** Have sex with one partner **[Nini olubalopo eyokan]** Avoid multiple sex partners **[Yera fun olubalopo pupo]** Vaccine **[Gbigba abere ajesara]** Avoid blood transfusions **[Year fun eje gbigba]** Avoid mosquito bites **[Maje ki efon je e]** Use antibiotics [**Lilo oogun adena kokoro arun]** Use of condom or other barrier methods **[Lilo roba idabobo ati awon miiran lati daabobo ara**] Washing of vagina after sex **[Fifo oju ara leyin ibalopo]** Other Specify **[Omiiran, salaye]**_____	|___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___|	

SECTION 4: SEXUAL RELATIONSHIPS, PARTNERSHIPS AND BEHAVIOURS

READ: I am now going to ask you some questions on your sexual relationships. By this, I mean any relationship that may involve kissing and touching your partner to sexually stimulate vagina, oral and anal sex.

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q401 sexrel	Are you currently involve in a sexual relationship? **[N je o ti nni ibalopo?]**[Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___| →	**If 02 Skip to Q407**
Q402 curpart	Who is your current main sexual partner? **[Tani olubase re nipa ibalopo?]** [Allow participant to mention their main sexual partner. Write the code for the response in the box]	No main sexual partners **[Ko si awon olubalopo]** = **01** Boyfriend **[Orekunrin]** = **02** Husband **[Oko]** = **03** Only casual sexual partners **[Olubalopo kan ni pato]** = **04**	|___|___|	
Q403 curpartcircum	Is your current main sexual partner circumcised? **[Se won dabe fun olubalopo re?]**[Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Don't know **[Mi o mo]** = **88**	|___|___|	
Q404 curpartage	How old is your husband or current main sexual partner? **[Omo odun melo ni oko re tabi olubalopo re?]** [Write the code for the response in the box]	Indicate age in years **[so ojo ori odun]** Don't know **[mi o mo]** = **88**	|___|___|	
Q405 curpartfriend	Does your husband or current main sexual partner have other wives or girl friends? **[Nje oko re tabi olubalopo re lowolowo ni aya miran tabi awon orebiriin?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Don't know **[mi o mo]** = **88**	|___|___|	
Q406 otherpart	Do you have other sexual partners besides your husband or current main sexual partner(s)? **[se oni olubalopo miiran yato si oko re tabi olubalopo re lowolowo?]** [Write the code for the response in the box]	Yes**[Beeni]** = **01** No**[Beeko]** = **02**	|___|___|	

READ: I will now ask you some personal questions about your previous and present sexual experiences. Please remember that your name is not on this questionnaire and all information you provide will be kept confidential. What is most important is that you answer such questions as fully and accurately as possible. So please, take as much time as you need to think about them when answering

Q407 evervs	Have you ever had vaginal sex before? By this I mean when a man (boy) puts his penis in your vagina)**[Nje o ti ni ibalopo lati oju ara ri?]**[	Yes**[Beeni]** = **01** No**[Beeko]** = **02**	|___|___| →	**If 02 skip to Q417**
Q408 agefvs	How old were you when you first had vaginal sex?**[Omo odun melo ni o nigba ti o ni ibalopo lati oju ara obinrin fun igba akoko?]**[Write the code for the response in the box]	Indicate age in years **[So ojo ori re ni odun]** Can't remember **[Mi o le ranti]** = **77**	|___|___|	

Q409 refvslov refvsmar refvsfp refvsmf refvspreg refvsrape refvsdrunk refvscp refvsother refvssp	Think back to the first time you had vagina sex, what was the main reason why you had your first vaginal sex? **[Ronu si igba akoko ti o ni ibalopo lati oju ara, kini idi Pataki ti o fi se ?]** [Please read out each of these options and ask if she knows any of them. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	In love **[Nipa ife]** Got married **[Mo ti laya]** To have fun/pleasure **[Fun igbadun]** For money /seek favours **[Fun owo ati lati wa oju rere]** To get pregnant **[Lati ni oyun]** Rape or forced **[Ifipa ba ni lo/fi dandan]** Drunk **[Mu yan imuti para]** Cajoled or Pressured **[Etan tabi lyo lenu]** Other, specify**[Omiiran, salaye]** _____	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
Q410 agefvspartner	How old was the person that you first had vaginal sex with? **[Kini ojo ori eni ti o koko ni ibalopo lati oju ara pelu?]** [Write the code for the response in the box]	Indicate age in years **[So ojo ori ni odun]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q411 vstotal	Throughout your whole life up until now, how many different people have you had vaginal sex with? **[Lati igba ti oti daye titi akoko yii awon eyan melo ni o ti ni ibalopo pelu?]** [Including current partners, past partners, spouse and all other kinds of partner. Write the code in the box]	Indicate number **[So iye won]** Can't remember**[Mi o le ranti]** = **77**	|____|____|	
Q412 vstwelve	How many different people in the last 12 months have you had vaginal sex with?**[Eeyan melo ni o ni ibalopo pelu lati oju ara ni osu mejila seyin]** [Including current partners, past partners, spouse and all other kinds of partner. Write the code in the box]	Indicate number**[So iye won]** Can't remember**[Mi o le ranti]**= **77**	|____|____|	
Q413 vsthree	How many different people in the last 3 months have you had vaginal sex with? **[Eeyan melo ni o ni ibalopo pelu lati oju ara ni osu meta seyin]** [Including current partners, past partners, spouse and all other kinds of partner. Write the code in the box]	Indicate number**[So iye won]** Can't remember**[Mi o le ranti]**= **77**	|____|____|	
Q414 ltvs	When did you last have vaginal sex? **[Igba wo nie ni ibalopo lati oju ara gbeyin?**] [Allow participant tell you and fit it into the options. Write the code for the response in the box]	Today **= 01 [Oni]** Less than a week ago = **02 [Ko ti to ose kan]** Within the last 3 months but more than a week ago = **03 arin osu meta sugbon ju osu kan lo]** Within the last 6 months but more than 3 months ago = **04 [Laarin osu mefa sugbon ju osu meta lo]** Within the last 12 months but more than 6 months ago = **05 [Laarin osu mejila ti o koja sugbon oju osu mefa lo]** More than one year ago = **06 [Oju odun kan lo]**	|____|____|	
Q415 lvscd	Did you or your partner used condom during your last vaginal sex? **[Se iwo tabi olubalopo re lo roba idabobo nigba ti e ni ibalopo gbeyin?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|____|____| →	**If 02 Skip to Q417**
Q416 relvscpreg relvscsti relvschiv relvscpain strelvscdtp relvscother relvscsp	What were the main reasons for using condoms during your last vaginal sex? **[Kini awon idi ti o fi lo roba idabobo lasiko ti o ni ibalopo gbeyin?]** [Allow participant tell you and fit it into the options. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	To prevent pregnancy **[Lati dena oyun]** To prevent STI **[Lati dena arun ibalopo]** To prevent HIV **[Lati dena arun kogboogun]** Partner insisted **[Olubalopo mi fi dandan]** Don't trust partner **[Olubalopo mi o nigbekele ninu]** Other, specify **[Omiiran, salaye]**_____	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
ORAL SEXUAL INTERCOURSE EXPERIENCE				
Q417 evergos	Have you ever give oral sex to a man/boy? By this I mean when you used your mouth or tongue to touch the penis or other genital area like the scrotum or anus of a man/boy**. [Nje o ti ni ibalopo lati enu agbalagba okunrin/omode? Nipa fifi enu tabi ahon kan nkan omokunrin tabi ni ayika ojuara okunrin bii idi tabi koropon okunrin.]** [Write the code for the response in the box]	Yes**[Beeni]**= **01** No**[Beeko]**= **02**	|____|____| →	**If 02 Skip to Q427**
Q418 agefgos	How old were you when you first gave oral sex to a man/boy? **[Omo odun melo ni e nigbati o koko ni ibalopo lati enu pelu**	Indicate the age in years **[So ojo ori ni odun]** Can't remember **[Mi o ranti]**= **77**	|____|____|	

	okunrin?] [Write the code for the response in the box]			
Q419 refgoslov refgosmar refgosfp refgosmf refrospreg regosrape refgosdrun refgoscp refgosavpr refgosme refgosother refgossp refgoscr	Think back to the first time you had oral sex, what was the main reason why you gave oral sex to a man/boy for the first time?**[Ronu si igba akoko ti o koko ni ibalopo lati enu ,kini idi ni pato ti o fi ni iru ibalopo bee fun igba akoko?]** [Please read out each of these options and ask if she knows any of them. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	In love **[Nipa ife]** Got married **[Mo ti loko]** To have fun/pleasure **[Fun igbadun]** For money /seek favours **[Fun owo/lati wa oju rere]** To get pregnant **[Lati loyun]** Rape or forced **[Ifipa bani lopo]** Drunk **[Imuti para]** Cajoled or Pressured **[Etan/lyo lenu]** To avoid pregnancy **[Lati dena oyun nini]** During menstruation **[Lasiko nkan osu]** Other, specify **[Omiiran, salaye]**_____	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
Q420 agefgospar tner	How old was the man/boy that you first gave oral sex to?**) [Omo odun melo ni agbalagba/omode okunrin ti o koko ni ibalopo lati enu pelu?]** [Write the code for the response in the box]	Indicate age in years**[So ojo ori ni odun]** Can't remember **[Mi o ranti]** = **77**	|____|____|	
Q421 gostotal	Throughout your whole life up till now, how many men/boys have you given oral sex? **[Ni gbogbo igbesi aye re titi di asiko yii awon okunrin melo ni o ti ni ibalopo lati enu pelu?] [Including current partners, past partners, spouse and all other partner;** write the number]	Indicate number **[So iye won]** Can't remember**[Mi o ranti]**= **77**	|____|____|	
Q422 gostwelve	How many men (boys) have you given oral sex in the last 12 months? **[Awon okunrin melo ni o ti ba se ibalopo lati enu ni osu mejila seyin?]** [Including current partners, past partners, spouse and all other kinds of partner**;** write the number]	Indicate number**[So iye won]** Can't remember**[Mi o ranti]**= **77**	|____|____|	
Q423 gosthree	How many men (boys) in the last 3 months have you given oral sex to? [**Okunrin melo ni o ti ba se ibalopo lati enu ni osu meta seyin?]**[Including current partners, past partners**,** spouse and all other kinds of partner**;** write the number**]**	Indicate number**[So iye won]** Can't remember**[Mi o ranti]**= **77**	|____|____|	
Q424 ltgos	When was the last time you gave oral sex to a man/boy? **[Igba wo ni o se ibalopo lati enu pelu okunrin gbeyin?]** [Allow participant tell you and fit it into the options. Write the code for the response in the box]	Today **= 0** Less than a week ago = **02** **[Ko ti to ose kan]** Within the last 3 months but more than a week ago = **03** **[Laarin osu meta sugbon ju osu kan lo]** Within the last 6 months but more than 3 months ago = **04** **[Laarin osu mefa sugbon ju osu meta lo]** Within the last 12 months but more than 6 months ago = **05** **[Laarin osu mejila ti o koja sugbon oju osu mefa lo]** More than one year ago= **06** **[Oju odun kan lo]**	|____|____|	
Q425 lgoscd	Did you or your partner use condom or any other barrier method during the last time you gave oral sex to a man/boy? **[Se iwo tabi olubalopo re eyikeyi ninu awon ona idabobo lati dabobo ara re nigbati o ni ibalopo lati enu?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|____|____| →	**If 02, skip to Q427**
Q426 relgorcpre reglorcsti relgorchiv relgorcpai relgorcdtp relgorcoth relgorcsp	What were the main reasons for using condoms or any other barrier method during the last time you gave oral sex to a man/boy? **[Kini awon idi ti o fi lo roba idabobo tabi awon ona idena miiran ni asiko ti o ni ibalopo lati enu?]** [Allow participant tell you. Write **"01" for YES** if she knows and **"02" for NO** if not ; Multiple responses are possible]	To prevent pregnancy **[Lati dena oyun]** To prevent STI **[Lati dena arun ibalopo]** To prevent HIV **[Lati dena arun kogboooogun]** Partner insisted **[Olubalopo mu mi ni dandan]** Don't trust partner **[Mi o ni igbekele ninu olubalopo mi]** Other, specify **[Omiiran, salaye]**_____	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
Q427 everros	Have you ever received oral sex from a man/boy? By this, I mean when a man/boy put his mouth or tongue on your genital area either outside or inside your vagina or anus.	Yes [Beeni]= **01** No [Beeko] = **02**	|____|____| →	**If 02 skip to Q437**

	[Nje o ti ni ibalopo lati enu pelu agbalagba okunrin/odokunrin?] [Write code for the response in the box]			
Q428 agefros	How old were you when you first received oral sex from a man/boy? **[Omo odun melo ni e nigba ti o koko ni ibalopo lati enu pelu agbalagba okunrin tabi odokunrin?]** [Write the age in the box]	Indicate age in years **[So ojo ori ni odun]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q429 agefrospartner	How old was the man/boy that you first received oral sex from? **[Omo odun melo ni agbalagba okunrin/odokunrin ti o koko ni ibalopo lati enu pelu re?]** [Write the code for the response in the box]	Indicate age in years **[So ojo ori ni odun]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q430 refroslov refrosmar refrosfp refrosmf refrospreg refrosrape refrosdrun refroscp refrosavpr refrosmen refrosother refrossp refroscr	Think back to the first time you had oral sex, what was the main reason why you received oral sex from a man/boy for the first time? **[Ronu pada seyin si igba akoko ti o ni ibalopo lati enu ki ni idi Pataki ti o fi se ibalopo lati enu pelu agbalagba okunrin tabi odokunrin fun igba akoko?].** [Please read out each of these options and ask if she knows any of them. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	In love **[Nipa ife]** Got married **[Mo ti loko]** To have fun/pleasure **[Fun igbadun]** For money /seek favours **[Fun owo/lati wa oju rere]** To get pregnant **[Lati loyun]** Rape or forced **[Ifipa bani lopo]** Drunk **[Imuti para]** Cajoled or Pressured **[Etan/lyo lenu]** To avoid pregnancy **[Lati dena oyun nini]** During menstruation **[Lasiko nkan osu]** Other, specify **[Omiiran]**_____	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
Q431 rostotal	Throughout your whole life up till now, how many men/boys have had oral sex with you? **[Ni gbogbo igbesi aye re di akoko yii, agbalagba tabi odokunrin melo ni o ti ba ni ibalopo lati enu?]** [Including current partners, past partners, spouse and all other kinds of partner**;** write the number**]**	Indicate the number **[So onka won]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q432 rostwelve	How many men/boys in the last 12 months have had oral sex with you? **Agbalagba okunrin tabi odokunrin melo ni o ti ni ibalopo lati enu pelu re ni osu mejila seyin?** [Including current partners, past partners, spouse and all other kinds of partner**;** write the number**]**	Indicate the number**[So onka won]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q433 rosthree	How many men/boys in the last 3 months have had oral sex with you? **[Agbalagba okunrin tabi odokunrin melo ni o ti ni ibalopo lati enu pelu re ni osu meta seyin?]**[Including current partners, past partners, spouse and all other kinds of partner**;** write the number**]**	Indicate the number **[So onka won]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q434 ltros	When was the last time you received oral sex from a man/boy?**[Igba wo ni o ni ibalopo lati enu gbeyin?]** [Allow participant tell you and fit it into the options. Write the code for the response in the box]	Today **= 01** **[Oni]** Less than a week ago = **02** **[Ko ti to ose kan]** Within the last 3 months but more than a week ago = **03** **[Laarin osu meta sugbon ju osu kan lo]** Within the last 6 months but more than 3 months ago = **04** **[Laarin osu mefa sugbon ju osu meta lo]** Within the last 12 months but more than 6 months ago = **05** **[Laarin osu mejila ti o koja sugbon oju osu mefa lo]** More than one year ago = **06** **[Oju odun kan lo]**	|____|____|	
Q435 lroscd	Did you or your partner use any barrier method during the last time that you received oral sex from a man/boy?**[Se iwo tabi olubalopo re lo eyikeyi nkan idabobo lasiko ti e ni ibalopo lati enu pelu okunrin tabi odokunrin?]** [Write the code for the response in the box]	Yes **[Beeni]= 01** No **[Beeko]= 02**	|____|____| →	**If 02 skip to Q437**
Q436 relroscpreg relrossti	What were the main reasons for using condom or barrier methods when you last received oral sex from a man/boy? **[Kini awon idi ti o fi lo roba idabobo tabi awon**	To prevent pregnancy **[Lati dena oyun]** To prevent STI **[Lati dena arun ibalopo]** To prevent HIV **[Lati dena arun kogboooogun]** Partner insisted **[Olubalopo mu mi ni dandan]**	|____|____| |____|____| |____|____| |____|____|	

relroshiv relrospainst relrosdtp relrosother relrossp	**ona idena miiran ni asiko ti o ni ibalopo lati enu pelu obirin?]** [Allow participant tell you. Write **"01" for YES** if she knows and **"02" for NO** if not ; Multiple responses are possible]	Don't trust partner **[Mi o ni igbekele ninu olubalopo mi]** Other, specify **[Omiiran, salaye]**_____	|____|____| |____|____|	
ANAL SEXUAL INTERCOURSE EXPERIENCE				
Q437 everras	Have you ever had anal sex? (By that I mean where a man (boy) puts his penis inside your anus) **[Nje o ti ni ibalopo lati iho ile igbonse ri?]** [Write the code for the response in the box]	Yes **[Beeni]= 01** No **[Beeko]= 02**	|____|____| →	**If 02 skip to Q448**
Q438 agefas	At what age did you first had anal sex?**[Bii omo odun melo ni e nigbati o ni ibalopo lati iho ile-igbonse fun igba akoko?]** [Write the code for the response in the box]	Indicate the number **[So onka]** Can't remember **[Mi o le ranti]= 77**	|____|____|	
Q439 agefraspartner	How old was the man (boy) that first had anal sex with you? **[Omo odun melo ni agbalagba okunrin(odokunrin) ti o koko ni iru ibalopo pelu fun igba akoko?]** [Write the code for the response in the box]	Indicate age in years **[So ojo ori re]** Can't remember**[Mi o le ranti]= 77**	|____|____|	
Q440 refraslov refrasmar refrasfp refrasmf refraspreg refrasrape refrasdrun refrascp refrasavpr refrasmen refrasother refrassp refrascr	Think back to the first time you had anal sex, what was the main reason why you had your first anal sex with your man/boy? **[Ronu pada seyin igba akoko ti o ni iru ibalopo bayi, kini awon idi Pataki ti o fi se pelu agbalagba okunrin/odokunrin?]** [[Please read out each of these options and ask if she knows any of them. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	In love **[Nipa ife]** Got married **[Mo ti loko]** To have fun/pleasure **[Fun igbadun]** For money /seek favours **[Fun owo/lati wa oju rere]** To get pregnant **[Lati loyun]** Rape or forced **[Ifipa bani lopo]** Drunk **[Imuti para]** Cajoled or Pressured **[Etan/iyo lenu]** To avoid pregnancy **[Lati dena oyun nini]** During menstruation **[Lasiko nkan osu]** Other, specify **[Omiiran]** _____ Can't remember **[Mi o le ranti]** = **77**	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
Q441 frascd	Did you or your partner use condom during your first anal sex? **[Se iwo ati olubara lo roba idabobo lasiko ti o koko ni ibalopo lati ibi iho ile-igbonse?]** [Write the code for the response in the box]	Yes **[Beeni]** = 01 No**[Beeko]**= 02	|____|____|	
Q442 rastotal	Throughout your whole life up till now, how many men (boys) have had anal sex with you? **[Lati igba ti oti daye titi di asiko yii, awon okunrin agbalagba (awon odokunrin) melo ni o ti ni ibalopo pelu won lati ibi iho ile-igbonse?]** [Include current partners, past partners & spouse**;** write the number**]**	Indicate the number **[So onka won]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q443 rastwelve	How many men (boys) in the last 12 months have had anal sex with you? **[Awon agbalagba okunrin(awon odokunrin) melo ni o ti ibalopo pelu won lati ibi iho ile igbonse ni osu mejila seyin?]**[Include current partners, past partners & spouse; write the number]	Indicate the number **[So onka won]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q444 rasthree	How many men (boys) in the last 3 months have had anal sex with you? **[Awon agbalagba okunrin(awon odokunrin) melo ni o ti ibalopo pelu won lati ibi iho ile igbonse ni osu meta seyin?]** [Include current partners, past partners & spouse; write the number in the box**]**	Indicate the number **[So onka won]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q445 ltras	When was the last time a man (boy) put his penis inside your anus? **[Igba wo ni agbalagba okunrin(odokunrin) ti nkan omokunrin bo oju iho ti o tin se igbonse gbeyin?]** [Allow participant tell you and fit it into the options. Write the code for the response in the box]	Today **= 01 [Oni]** Less than a week ago = **02 [Ko ti to ose kan]** Within the last 3 months but more than a week ago = **03 [Laarin osu meta sugbon ju osu kan lo]** Within the last 6 months but more than 3 months ago = **04 [Laarin osu mefa sugbon ju osu meta lo]** Within the last 12 months but more than 6 months ago = **05 [Laarin osu mejila ti o koja sugbon oju osu mefa lo]** More than one year ago = **06 [Oju odun kan lo]**	|____|____|	
Q446 lrascd	Did you or your partner use condom or any other barrier method during the last time you	Yes **[Beeni]= 01** No **[Beeko]= 02**	|____|____|	**If 02 skip to Q448**

	received anal sex from a man? **[Se iwo tabi olubalopo re lo roba idabobo tabi ona idabobo miiran lasiko ti o ni ibalopo lati oju iho ti o ti n se igbonse pelu okunrin?]** [Write the code for the response in the box]		→	
Q447 relrascpre relrascsti relraschiv relrascpai relrascdtp relrascoth relrascsp	What were your main reasons for using barrier methods during the last time you received anal sex from a man/boy? **[Kini awon idi Pataki ti o fi lo awon ona idabobo lasiko ti o ni ibalopo pelu okunrin loju iho ti oti n se igbonse?]**[Allow participant tell you. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	To prevent pregnancy **[Lati dena oyun]= 01** To prevent STI **[Lati dena arun ibalopo]** = **02** To prevent HIV **[Lati dena arun kogboogun]** = **03** Partner insisted **[Olubalopo mi fi dandan]** = **04** Don't trust partner **[Mi o nigbekele ninu olubalopo mi]** = **05** Other, specify **[Omiiran, salaye]**_____ = **06**	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
TRANSACTIONAL SEX				
Q448 everts	Have you ever had sex because he gave you, or told you that he would give you gifts, cash, or anything else? [This includes oral, anal or vaginal sex] [**N je o ti ni ibalopo pelu enikan nitori pe o fun e ni nkan tabi so fun e wipe oun a fun e ni ebun owo tabi ohunkohun?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|____|____| →	**If 02 skip to Q501**
Q449 tstwelve	In the past 12 months, how many men (boys) have you had sex with because he gave you or told you he would give you gifts, cash, or anything else? **[Ni bii osu mejila seyin, obinrin agbalagba (odokunrin) melo lo ti ni ibalopo pelu re nitoripe o fun e tabi so fun e pe oun yoo fun e ni ebun owo tabi ohunkohun?]**[This includes oral, anal or vaginal sex][Write the code for the response in the box]	Indicate the number **[So onka won]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q450 tsthree	In the past 3 months, how many men (boys) have you had sex with because he gave you or told you he would give you gifts, cash, or anything else? **[Ni osu meta seyin, okunrin agbalagba (odokunrin) melo lo ti ni ibalopo pelu re nitoripe o fun e tabi so fun e pe oun yoo fun e ni ebun owo tabi ohunkohun?]** **[**This includes oral, anal or vaginal sex**]**[Write the code for the response in the box]	Indicate the number **[So onka won]** Can't remember **[Mi o le ranti]** = **77**	|____|____|	
Q451 ltts	When was the last time you had sex with anyone because he gave you or told you he would give you gifts, cash, or anything else? **[Igbawo ni o ni ibalopo pelu enikan nitori pe o fun e ni nkan tabi so fun e wipe oun a fun e ni ebun owo tabi ohunkohun?]** [This includes oral, anal or vaginal sex] [Allow participant tell you and fit it into the options. Write the code for the response in the box]	Today **= 01 [Oni]** Less than a week ago = **02 [Ko ti to ose kan]** Within the last 3 months but more than a week ago = **03 [Laarin osu meta sugbon ju osu kan lo]** Within the last 6 months but more than 3 months ago = **04 [Laarin osu mefa sugbon ju osu meta lo]** Within the last 12 months but more than 6 months ago = **05 [Laarin osu mejila ti o koja sugbon oju osu mefa lo]** More than one year ago = **06 [Oju odun kan lo]**	|____|____|	
Q452 lttscd	During the time you had transactional sex, did you use a condom? **[Lasiko igba ti o ni ibalopo,nje o lo roba idabobo?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Can't remember **[Mi o ranti]=77**	|____|____|	

SECTION 5: NON-PENETRATIVE SEXUAL PRACTICES

READ: Some people derive sexual pleasure including orgasm by touching parts of body especially genital area without intercourse (vaginal, oral or anal). They perform these act themselves (self-masturbation) or on their partner (mutual masturbation). In this interview, we mean vulva and vagina as female genital area, and penis and scrotal area as male genital area.

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q501 smasturb smasturb	Have you ever touched your genitals or inserted your finger(s) into your vagina or anus? **[Nje o ti fi owo kan ayika oju ara re ri tabi ki o ti ika kan tabi meji bo oju ara re ri tabi iho ti o ti n se igbonse?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Can't remember **[Mi o ranti]** = **77**	|____|____| →	**If 02 skip to Q503**
Q502 agesmasturb	How old were you when you first touched your genitals or inserted your finger(s) into your vagina or anus? **[Omo odun melo ni e nigba ti o koko fi owo ka nayika oju ara re tabi ti ika bo oju ara re tabi iho ile igbonse re?]** [Write the code for the response in the box]	Indicate the age in years **[So ojo orire]** Can't remember **[Mi o ranti]** = **77**	|____|____|	

Q503 obj	Have you ever inserted another object into your vagina? **[Nje o ti ti nkan miiran bo oju ara re ri?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Can't remember **[Mi o ranti]** = **77**	|___|___| →	**If 02 or 77 skip to Q505**
Q504 objtyp objtypsp	What objects have you ever inserted into your vagina? **[Nkan wo ni o ti tibo oju ara re ri?]** [Write the code for each that participant mentioned in the box]	Hand **[Owo]**= **01** Vibrator **[Irinse ti o maa ngbon]**= **02** Candle **[Abela]** = **03** Other, specify **[Omiiran, salaye]**___ = **04**	|___|___| |___|___| |___|___| |___|___|	
Q505 salgenital	Do you put saliva in your hand before you touch your genital area? **[Se o maa nfi ito sowo ki o to fi owo kan oju ara re?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Can't remember **[Mi o ranti]** = **77**	|___|___|	
Q506 mmasturb	Have you or your partner ever touch each other's genital area by hand (mutual-masturbation)? [**N je iwo tabi olubalopo re ti fi owo kan ayika oju ara yin ri pelu owo?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Can't remember **[Mi o ranti]** = **77**	|___|___| →	**If 02 or 77 skip to Q601**
Q507 boyfinger	Have you ever had a man (boy) put his fingers inside your vagina? **[N je agbalagba okunrin(odokunrin) Kankan ti ti ika bo oju ara re ri?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Can't remember **[Mi o ranti]** = **77**	|___|___|	
Q508 handpenis	Have you ever put your hands on a man's (boy) penis? **[N je o ti fi owo kan nkan omokunrin ri?]**[Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02** Can't remember **[Mi o ranti]** = **77**	|___|___|	

SECTION 6: CIRCUMCISION & INTRAVAGINAL PRACTICES

READ: I would now also like to ask you about other behaviours and practices concerning the genitals.

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q601 circum	Have you been circumcised? **[Se won ti dabe fun e ri?]** [Write the code for the response in the box]	Yes**[Beeni]**= **01** No**[Beeko]**= **02** Don't know **[Mi o mo]**= **88**	|___|___|	
Q602 clvag	Many women cleanse inside the vagina. Cleansing is defined as cleaning inside the vagina with water or another substance. Do you ever cleanse inside the vagina? By that I mean cleansing by inserting half a finger or a whole finger? **[Opolopo obinrin lo maa nfo inu oju ara.fifo tumo si oju ara fifo pelu omi tabi eroja miiran.n je o ti fo inu oju ara re ri? Nkan ti o tumo si nipe fifi idaji ika tabi odidi ika fo inu oju ara]** [Write the code for the response in the box]	Yes**[Beeni]**= **01** No**[Beeko]**= **02** Can't remember **[Mi o ranti]**= **77**	|___|___| →	**If 02 or 77 skip to Q701**
Q603 fclvag	How often do you cleanse inside the vagina?**[Bawo ni o se maa nfo nkan Oju Ara re si?]** [Write the code for the response in the box]	Every day **[Ojojumo]** = **01** Few days a week **[Awon ojo die laari nose]** = **02** Every week **[Osoose]** = **03**	|___|___|	
Q604 tclvagtl tclvagbath tclvagbsex tclvagasex tclvagodvag tclvagmens tclvagdisch tclvagother tclvagsp	When do you usually cleanse inside the vagina? **Igba wo ni o saba ma nfo nkan oju ara re?** [Please read out each of these options and ask if she knows any of them. Write **"01" for YES** if she knows and **"02" for NO** if not. Multiple responses are possible]	Anytime I use the toilet **[Nigbakugba ti moba lo si ile igbonse]** When bathing **[Ti moba n we]** Before sexual intercourse **[Ki nto ni ibalopo]** After sexual intercourse **[leyin ibalopo]** Anytime I perceive an odour from my vagina **[Nigbakugba ti moba gbo oorun lati oju ara mi]** During or after completing my menstruation **[Lasiko ati leyin nkan osu]** To remove vaginal discharge **[Lati fo nkan ti o n jade lati oju ara mi]** Other, specify **[Omiiran]**_____	|___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___|	
701 tc	Time Interview Completed **[Ipari iforowanilenuwo]** [Write in hours:minutes]	|_____|_____|:|_____|_____| HRS MINS		
702 intcom	The interview completed? **[Se iforowanilenuwo pari?]** [Write the code in the box, **"01" for YES and "02" for NO**]	Yes **[Beeni]** = **01** No **[Beeko]**= **02**	|___|___|	

SECTION 8: MEDICAL HISTORY

This section will be handled by the healthcare worker that will also be responsible for taking the biological samples. All the samples will be collected by the trained research nurse READ: I will now ask you some questions about your general health, and thereafter, examine and collect samples from your blood, mouth, genital area (vulva and cervix) and anus. Our staff will refer people whose results of tests requires further evaluations or treatment.

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q801 asma hyt dm anyca anycasp other othersp	Do you have any of the following chronic health problems? [Nje eni ikankan ninu awon ailera wonyi?] [Write 01 in the box for each chronic medical problem that the participant have; Write 02 in the box of participant did not have this diseae;88 for if the participant did not know]	Asthma [Iko gbofungbofun] Hypertension (High blood pressure) Eje riru(ifunpa giga) Diabetes mellitus[Ito suga] Any cancer, specify [Eyikeyi jejere, salaye] _____ Other, specify [Omiiran, salaye]_____	|____|____| |____|____| |____|____| |____|____| |____|____|	Refer to MOP clinic
Q802 hivtest	Have you ever been tested for HIV infection? [N je o ti se ayewo fun arun kokoro (HIV/AIDS) ri?][Write the code for the response in the box]	Yes [Beeni] = 01 No [Beeko] = 02	|____|____|	If 02, Skip to Q806 Refer to ART clinic
Q803 hivtresult	If YES to Q802, what was the outcome of your last HIV test?[Ti idahun ibeere 802 ba je beeni, kini abajade ayewo HIV ti o se koja?] [Write the code for the response in the box]	Positive [O wa nibe]= 01 Negative [Ko si nibe]= 02 Inconclusive [Ko ti yanju]= 03 Don't know [Mi o mo]= 88	|____|____|	Refer to ART clinic
Q804 arv	Are you on Anti-Retroviral Treatment now? [N je o wa lori oogun itoju HIV?] [Write the code for the response in the box]	Yes[Beeni]= 01 No[Beeko]= 02	|____|____|	
Q805 tarv	If YES to Q804, how long have you been on Anti-Retroviral Treatment? [Ti o baje beeni si ibeere 804, o ti to bi igba wo ti o ti wa lori oogun itoju yii?] [Write the code for the response in the box]	Less than 6 months [Odin ni osu mefa] = 01 6-12 months [Osu mefa si mejila] = 02 More than 1 year [O ju odun kan lo] = 03 No Response [Ko si idahun]= 04	|____|____|	
Q806 sympfever sympabdp sympdypar sympvitch sympsmell sympabdc sympsore sympbleed symplump sympother sympsp	Do you have any of the following symptoms now? [N je o ni ikankan ninu awon apeere arun wonyi bayii] Please read out each of these options and ask if she knows any of them. Write 01 for YES if she has any of the symptoms and 02 for NO if not; Multiple responses are possible]	Fever [Ara gbigbona] Abdominal pain [Inu rirun] Pain during vaginal sexual intercourse [Irora lasiko ibalopo] Vaginal itching [Oyun lati oju ara] Foul smell from the genitals [Oorun lati ayika oju ara] Abnormal vaginal discharge [Eje jijade lati oju ara] Vaginal sores/blisters [Egbo lati oju ara] Abnormal vaginal bleeding [Eje jijade lati oju ara] Lumps in genital area [Oju ara lile] Other Specify [Omiiran, salaye] _____	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	

SECTION 9: CLINICAL EXAMINATION

READ: I will conduct some physical and clinical examinations, and also, collect samples from your blood, mouth, genital area (vulva and cervix) and anus. The blood sample is to test for HIV infection while other samples (mouth, genital area and anus) are to screen for human papillomavirus infection. Please remember your name will not be written on this form. Your results will only be shared with you alone. Our staff will refer people whose results requires further evaluations or treatment. This section will be handled by the healthcare worker that will also be responsible for taking the biological samples. All the samples will be collected by the trained research nurse.

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q901	**Part 1: Physical and Clinical Measurements**			
Q901A wt	Weight [W]	Weight (Kg)	|____|____|____|	
Q901B ht	Height[H]	Height (Metres)	|____|____|____|	
Q901C pr	Pulse rate [PR]	PR	|____|____|____|	
Q901D sbp	Blood pressure [BP]	Systolic BP (mmHg)	|____|____|____|	
Q901E dbp		Diastolic BP (mmHg)	|____|____|____|	
Q901F uriclt	Indicate whether urine sample has been collected or not	Yes = **01** No = **02**	|____|____|	
Q901G uricltbc	If YES, place the duplicate barcode for urine sample	**Place the URINE SAMPLE barcode here**		
Q901F uringly urinprot urinleu urinnitr	Urinalysis [Instruct participant to collect a midstream urine as in SOP and use a multistix to assess the following parameters. Circle the appropriate results]	Glycosuria Proteinuria Leucocytes Nitrites	nil + ++ +++ ++++ nil + ++ +++ ++++ nil + ++ +++ ++++ nil + ++ +++ ++++	

Q902	**[Conduct a pre-test counselling for HIV test; take permission to collect blood sample from the participant at this point; conduct Rapid HIV Screening according to the SOP & conduct a post-test counselling]**			
Q902A bldsclt	Indicate whether blood sample has been collected or not.	Yes = **01** No = **02**	|____|____|	
Q902B bldscltbc	If YES, place the duplicate barcode for the blood sample	**Paste the BLOOD SAMPLE barcode here**		
Q902C detres	Determine HIV Rapid test result [Take a small sample of whole blood with capillary tube and perform HIV rapid test with determine kit as per protocol. Indicate the result as either 'positive' or 'negative' in the response box]	HIV positive = **01** HIV negative = **02**	|____|____|	**If the result of Q902C is negative, skip to Q902F**
Q902D ugdres	Uni-Gold HIV Rapid test result [**Perform if the result of Q902C is positive]** [Take a small sample of whole blood with capillary tube and perform HIV rapid test with Uni-gold kit as per protocol. Indicate the result as either 'positive' or 'negative' in the response box]	HIV positive = **01** HIV negative = **02**	|____|____|	**If the result is the same with Q902C skip to Q902F**
Q902E stpres	Statpack HIV Rapid test result [Take a small sample of whole blood with capillary tube and perform HIV rapid test with Statpack kit as per protocol. Indicate the result as either 'positive' or 'negative' in the response box]	HIV positive = **01** HIV negative = **02**	|____|____|	
Q902F frht	Indicate the final result of Rapid HIV screening test. [Write "01" for YES and "02" for N0 according to the SOP]	HIV positive = **01** HIV negative = **02**	|____|____|	
Q903	**[Take permission to collect mouthwash sample from the participant at this point & Store the sample immediately according to the SOP]**			
Q903A oralsclt	Indicate whether oral sample has been collected or not.	Yes = **01** No = **02**	|____|____|	
Q903B oralscltbc	If YES, place the duplicate barcode for the oral sample	**Paste the ORAL SAMPLE barcode here**		
Q904	**Part 3. Examination of the external genital area.** Reaffirm from the study participant that you will need to examine her genital area. Briefly, tell her that you will inspect the genital area before collecting the sample from vulva, cervix and anus. Ensure you take permission from the participant before you start.			
Q904A ocircum	Has she been circumcised? [Write the code for the response in the box]	Yes = **01** No = **02**	|____|____|	
Q904B **gen**ulcer	Any ulceration or sores in the genital area? [Write the code of your finding in the box]	Present = **01** Absent = **02**	|____|____|	If "02" skip to Q904D
Q904C ulmaj ulmin ulint ulper	Where are the ulcers/sores/vesicles? [Write **01** if wart is present in any of the anatomic sites; **02** if it is not present]	Labia majora Labia minora Introitus Perineum	|____|____| |____|____| |____|____| |____|____|	
Q904D genwart	Any genital warts in the external genital area?[Write the code of your finding in the box]	Present = **01** Absent = **02**	|____|____|	If "02" skip to Q905
Q904E wartmaj wartmin wartint wartper	Location of genital warts? [Write **01** if wart is present in any of the anatomic sites; **02** if it is not present]	Labia majora labia minora Introitus Perineum	|____|____| |____|____| |____|____| |____|____|	
Q905	**[Take permission from participant to collect the vulvar sample at this point with Dacron Swab & Store immediately according to the SOP]**			
Q905A vfsclt	Indicate whether vulva sample has been collected with Dacron Swab	Yes = **01** No = **02**	|____|____|	
Q905B vfsbc	If YES, place the duplicate barcode for the vulva sample	**Paste VULVA SAMPLE barcode here**		
	Part 4. Speculum Examination Reaffirm with the study participant that you will need to pass a speculum into their private part to examine the cervix and also take a sample.			
Q906	**Examination of the VAGINA [**Conduct vaginal examination as described in the SOP and record your findings]			
Q906A vagsc	Check for colour of vaginal secretions and Record in code in the response box. [Write the code of your finding in the box]	Normal (clear/mucoid) = 01 White & curdlike = 02 White & homogenous = 03 Bloody = 04 Yellow = 05 Purulent (greenish) = 06	|____|____|	
Q907	**Examination of the CERVIX** [Make sure you can visualise the cervix, and record your findings]			

Q907A cer	Cervix seen?[Write the code of your finding in the box]	Yes = **01** No = **02**	|____|____|	
Q907B cerdis	Cervical discharge [[Write the code of your finding in the box]	None/Normal (clear/mucoid) = **01** White & curdlike = **02** White & homogenous = **03** Bloody = **04** Yellow = **05** Purulent (greenish) = **06**	|____|____|	
Q907C cerulcer	Cervical ulcers? [Write the code of your finding in the box]	Yes = **01** No = **02**	|____|____|	
Q907D cerbled cerect cergrowth cerother cersp	Other cervical findings [Write **01** if lesion is present in any of the anatomic sites; **02** if it is not present]	Contact bleeding Ectopy Suspicious growth in the cervix (?cancer) Other lesions Specify_____	|____|____| |____|____| |____|____| |____|____|	
	[Take permission from the participant to collect cervical sample at this point with a Dacron swab and Store the sample immediately according to the SOP]			
Q907E cerclt	Indicate that Cervical sample taken with Dacron Swab	Yes = **01** No = **02**	|____|____|	
Q907F cerlesionsbc	If YES, place the duplicate barcode for the cervical sample	**Paste CERVICAL SAMPLE barcode here**		
Q908	**Part 5: Examination of the PERI-ANAL AREA and RECTUM** [Inspect first, take anal sample before you perform digital examination]			
Q908A andis	Any discharge from the anus? [Write the code of your finding in the box]	Yes = **01** No = **02**	|____|____|	
Q908B anulcer	Any ulcer in the peri-anal area? [Write the code of your finding in the box]	Yes = **01** No = **02**	|____|____|	
Q908C anwart	Anal warts? [Write the code of your finding in the box]	Yes = **01** No = **02**	|____|____|	
Q908D haemor rectprolap analother analsp	Any other lesions around the anus? Write **01** if lesion is present in any of the anatomic sites; **02** if it is not present]	Haemorrhoids Rectal wall prolapse Other Specify_____	|____|____| |____|____| |____|____|	
	[Take permission from the participant to collect anal sample at this point with a Dacron swab and Store the sample immediately according to the SOP]			
Q908E analsclt	Indicate that anal sample has been collected with Dacron swab	Yes = **01** No = **02**	|____|____|	
Q908F analscltbc	If YES, place the duplicate barcode for the anal sample	**Paste ANAL SAMPLE barcode here**		
Q919 blsamp orsamp vulvsamp cersamp anasamp	Record all samples that were collected [Write "01" for YES, collected and "02" for NO, not collected	Blood sample Oral sample Vulva sample Cervical sample Anal sample	|____|____| |____|____| |____|____| |____|____| |____|____|	
Q920 dvds	Make a diagnosis of Vaginal Discharge Syndrome [Write "01" for YES and "02" for NO]	Yes = **01** No = **02**	|____|____|	Refer to STI Treatment Guideline
Q921 dpid	Make a diagnosis of Pelvic Inflammatory Disease: Female Abdominal Pain [Write "01" for YES and "02" for NO]	Yes = **01** No = **02**	|____|____|	Refer to STI Treatment Guideline
Q922 dgud	Make a diagnosis of Genital Ulcer Disease [Write "01" for YES and "02" for NO]	Yes = **01** No = **02**	|____|____|	Refer to STI Treatment Guideline
Q923 dgenwa	Make a diagnosis of Genital Warts [Write "01" for YES and "02" for NO]	Yes = **01** No = **02**	|____|____|	Refer to STI Treatment Guideline
Q924 dcc	Make a clinical diagnosis of suspicious cervical cancer growth [Write "01" for YES and "02" for NO]	Yes = **01** No = **02**	|____|____|	If 01, Refer to Gynea Clinic
Q925 dhyt	Make a diagnosis of Hypertension if BP is 140/90mmHg and above [Write "01" for YES and "02" for NO]	Yes = **01** No = **02**	|____|____|	Refer to a Physician

Q926 glycosuria	Make a diagnosis of glycosuria *[Write "01" for YES and "02" for NO]*	Yes = 01 No = 02	|____|____|	*Refer to a physician*
Q927 anydiag anydiagsp	Make any other diagnosis *[Write "01" for YES and "02" for NO]*	Yes = 01 No = 02 *Yes, specify*_____	|____|____|	*Refer to a physician*
Q928 tc	Time Medical History & Examination Completed *[write in hours: minutes]*	|_____|_____:|_____|_____| HRS MINS		
Q929 intcom intcomsp	The interview completed? *[Write the code in the box]*	Yes = 01 No = 02 *If No, specify*_____	|____|____|	

Use the National STI Treatment Guideline to prescribe drugs according to the diagnosis. Circle the REGIMEN that is prescribed.

VAGINAL DISCHARGE SYNDROME

COMMON CAUSES	DRUGS AND FIRST REGIMEN	ALTERNATE REGIMEN	PRECAUTION IN PREGNANCY
Vaginitis: Candidiasis Trichonomiasis Bacterial vaginosis	Metronidazole 2 g orally in a single dose *PLUS* Nystatin Vaginal pessaries 100,000 units inserted every night for 14 days	Metronidazole 2g orally in a single dose AND Clotrimazole vaginal pessaries 100mg inserted every night for 6 days	Tinidazole orally stat as a single dose AND Tioconazole 300mg vaginal ovule as a single dose
Cervicitis: Gonorrhea Chlamydia	Azithromycin 2g orally stat only AND Doxycycline 100mg tab. Orally twice daily for 7 days	Ceftriaxone 250mg IM as a single oral dose OR Ofloxacin 400mg tabs orally as a single dose AND Erythromycin 500mg tab. Orally four times a day for 7days	Azithromycin 2g orally stat OR Erythromycin base 500mg tab. Orally four times a day for 7 days

PELVIC INFLAMMATORY DISEASE: FEMALE LOWER ABDOMINAL PAIN

COMMON CAUSES	DRUGS AND FIRST REGIMEN	ALTERNATE REGIMEN	PRECAUTIONS IN PREGNANCY
Gonococcal Chlamydia Anaerobes	Azithromycin 2 g orally once Metronidazole 2g orally once	IM Ceftriaxone 250 mg once Tinidazole 2g once	In pregnancy, Patients should be referred for hospitalization and treated with appropriate IV parenteral therapy

GENITAL ULCER DISEASE

COMMON CAUSES	DRUGS AND FIRST REGIMEN	ALTERNATE REGIMEN	PRECAUTIONS IN PREGNANCY
SyphilisAdults Chancroid (Adults) *Granuloma inguinale* *Lymphogranuloma venereum*	Benzathine Penicillin 2.4million units IM once PLUS Azithromycin 2 g orally once weekly for 3weeks	Procaine Penicillin 2.4million units IM once daily for 10 – 14days Erythromycin base 500 mg orally 3 times a day for 21 days	For penicillin-allergic non-pregnant patients only; Doxycycline 100 mg orally 2 times a day for 14 days OR Tetracycline 500 mg orally 4 times a day for 14 days
Herpes simplex Adults 1st Clinical Episode	Acyclovir 400 mg orally 3 times a day for 7-10 days OR 200 mg orally 5 times a day for 7-10 days	Famciclovir18 250 mg orally 3 times a day for 7-10 days OR Valacyclovir 1 g orally 2 times a day for 7-10 days	

GENITAL WARTS

Genital growths (warts)	Podophyllin 0.5% gel application OR Acyclovir 400 mg orally 3 times a day for 7-10 days OR 200 mg orally 5 times a day for 7-10 days	Podophyllin 0.5% gel application OR Famciclovir18 250 mg orally 3 times a day for 7-10 days OR Valacyclovir 1 g orally 2 times a day for 7-10 days	

This is the end of the interview, examination and sample collection. Thank the participant for their time and remind them if there is any need for follow-up visit *Give reimbursement to participant. Please tell her that she will be contacted (telephone or email) for her other results.*

Record the Number of Contact Slips:	**|_____|_____|**
DATE OF FIRST FOLLOW-UP VISIT	**|_____|_____|/|____|_____|/|____|____|____|_____|** **DD MM YYYY**
DATE OF SECOND FOLLOW-UP VISIT	**|_____|_____|/|____|_____|/|____|____|____|_____|** **DD MM YYYY**

DATA MANAGEMENT ONLY				
	QUESTIONNAIRE QUALITY CHECKER	FIRST DATA ENTRY	SECOND DATA ENTRY	VERIFICATION
INITIALS				
DATE				

Healthworker's Note

Notes

ANNEX 5.1: LIST OF MAPPED BROTHELS WITH NUMBER OF SELECTED PARTICIPANTS

S/N	BIN	Local Government Area/Code	No of Participants Listed	No of Participant Interviewed
1	0022	Ibadan South West /005	4	4
2	0020	Ibadan South West /0020	3	3
3	0025	Ibadan South East /006	6	6
4	0026	Ibadan South East /006	4	4
5	0028	Ibadan South East /006	9	9
6	0011	Ibadan North East/003	3	3
7	0010	Ibadan North East/003	7	7
8	0003	Ibadan North/001	9	9
9	0017	Ibadan North West /004	3	3
10	0016	Ibadan North West /004	4	4
11	0014	Ibadan North West /004	7	7
12	0030	Ibadan North West /004	5	5
13	0019	Ibadan North West /004	3	3
14	0013	Ibadan North West /004	5	5
15	0031	Ibadan North West/004	13	11
16	0015	Ibadan North West /004	2	2
17	0018	Ibadan North West /004	6	6
18	0005	Akinyele/002	13	11
19	0007	Akinyele/002	17	15
20	0008	Akinyele/002	13	11
21	0006	Akinyele/002	9	9
22	0001	Ibadan North/001	22	20
23	0009	Akinyele/002	15	14
24	0027	Ibadan South East/006	18	15
25	0002	Ibadan North/001	34	31
26	0023	Ibadan South West/005	20	17
27	0024	Ibadan South West/005	16	13
28	0004	Ibadan North/001	75	68
			344	**315**

BIN – Brothel Identification Number

ANNEX 5.2: ADDITIONAL QUESTIONS FOR FEMALE SEX WORKERS ONLY

SECTION 7: INFORMATION ON SEX WORK ACTIVITY

READ: I will now ask you some personal questions in relation to your work. Please remember that your name and other means of identity is well protected. Thank you.

	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE COLUMN	SKIP
Q701 durcsw	How long have you been involved in commercial sex work activity? [**o tito bii odun melo ti e ti n se ise yii]** [Assist participant to calculate number of completed years]	Indicate number of years **[So iye odun]** Record '00' if less than 1 year **[ko odun'00' ti ko ba to odun]**	|___|___|	
Q702 rmoney rfun renv rjob rhus rfri rcajdec rfc rother rsp	What were your main reasons for engaging in commercial sex work? **[kini awon idi ti e fi n se ise yii]** [Allow participant to tell you her reason(s) Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	To get money **[lati ri owo]** To have fun **[fun igbadun]** To have a change of environment **[lati yii agbegbe pada]** Because I have no job **[to ripe mi oni ise miiran]** Because I lost or separated with my husband **[toripe mo padanu oko mi]** To join my friends/colleagues **[lati darapo mo awon ore/elegbe mi]** Cajoled/deceived to join sex work **[Se won tan yi tie fi darapo mo ise yi]** Forced to join sex work **[se won fi ipa mun yin mo ise yi]** Other reason(s) **[awon idi miiran],** Specify **[salaye]**_____	|___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___| |___|___|	
Q703 cswnowk	On average, how many men pay you for vagina, oral or anal sex every week? **[ti e ba fi oju da, o maa nto bii okunrin melo ti e man ri ni aarin ose kan fun ibalopo oju ara tabi enu tabi lati enu oju ile igbonse?]** [Assist participant to calculate number of sex partners]	Indicate the number **[so iye /onka won]**	|___|___|	
Q704 cswnoday	On average, how many men pay you for vagina, oral or anal sex every day? **[ti e ba fi oju da, o maa nto bii okunrin melo ti e man ri ni ojo kan fun ibalopo oju ara tabi enu tabi lati enu oju ile igbonse?]** [Assist participant to calculate number of sex partners]	Indicate the number **[so iye /onka won]**	|___|___|	
Q705 everuvs	Have you ever allowed unprotected vagina sex with men that pay you but refuse to use condom? **[nje e ti ni ibalopo lati oju ara yin pelu onibara yin okunrin ti won ko lati lo roba idabobo pelu yin?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	
Q706 everugos	Have you ever give oral sex to men that pay you but refuse to use condom? **[nje e tigba ri ki e fi enu yin tabi ahon yin kan oko onibara yin nigbati eni ibalopo pelu won, sugbon ti won ko jale lati lo roba idabobo pelu yin?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	
Q707 everuros	Have you ever received oral sex from men that pay you but did not use mouth gag or any protection? **[nje e ti gba ri ki onibara yin okurin fi enu won kan oju arayin nigba ti eni ibalopo pelu won sugbon ti won ko lai lo idabobo kankan?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	
Q708 everuras	Have you ever received unprotected anal sex from men that pay you but refused to use condom? **[nje e ti gba ri ki onibara yin okurin bayin ni ibalopo lati enu ile iyagbe yin nigbati f ti won ko lai lo idabobo kankan?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|___|___|	

Q709 usathree	Have you provided any unprotected sexual activity (vagina or oral or anal sex) to men that pay you in the past 3 months? **[nje e ni ibalopo lai lo roba idabobo pelu inibara yin ni osu meta seyin?]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|____|____|	→ **If 02, skip to Q712**
Q710 usalast	When was the last time you provided unprotected sex to any man that pay you? By this I mean, vaginal or oral or anal sex. **[igba wo ni eni ibalopo lai lo roba idabobo pelu onibara yin gbeyin? Ibalopo lati oju ara tabi enu tabi iho ile igbonse]** [Allow participant to tell you and fit it into the options. Write the code for the response in the box]	Today = **01** **[Oni]** Less than a week ago = **02** **[Ko ti to ose kan]** Within the last 3 months but more than a week ago= **03** **[Laarin osu meta sugbon ju osu kan lo]** Within the last 6 months but more than 3 months ago = **04** **[Laarin osu mefa sugbon ju osu meta lo]** Within the last 12 months but more than 6 months ago = **05** **[Laarin osu mejila ti o koja sugbon oju osu mefa lo]** More than one year ago = **06** **[Oju odun kan lo]**	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
Q711 usamoney usacaj usaforce usaalch usadrug usalove usaejac usaerect usapatref usaknow usaviolc usalosc usancd usacddl usapreg usaother usasp	What were your main reasons (s) for engaging in an unprotected sex with your commercial sex partner? **[kini awon idi Pataki ti e fi ni ibalopo lai lo roba idabobo pelu awon onibara yin?]** [Please read out each of these reasons for the partcipant. Write **"01" for YES** if she knows and **"02" for NO** if not; Multiple responses are possible]	To get more money **[lati ri owo]** Cajoled **[pelu etan]** Forced **[pelu ipa]** Under the influence of alcohol **[oti mimu yo]** Under the influence of drug (cocaine) **[ogun oloro lilo]** For those that I like or love **[nipa ife]** To hasten ejaculation **[lati le jeki nkan omokunrin tete wa]** To avoid sustained erection **[lati je ki oko onibara ti wala]** Commercial partner refused condom **[kiko jale onibara mi]** Because he is well known to me **[nitori o je eni mimo mi]** Fear of violence from the client **[nitori o won fi ipamumi]** Fear of losing the client **[nitori lati padanu awon oni bara mi]** No money to buy condom **[ko si owo lati ra roba idabobo]** I don't like to use condoms **[ni tori pe mi o feran lati lo roba idabobo]** I want to get pregnant **[ni tori p emo fe lo yun]** Other **[omiiran]** Specify **[salaye]**_____	|____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____| |____|____|	
Q712 cdconv	Have there been times when a man refused to use a condom, but you convinced him to use it? **[n je oti ni igba ti oni bara okunrin ti yari lati lo roba idaabobo sugbon ti e pe arowa fun lati loo]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|____|____|	
Q713 cddiff	Was it difficult for you to negotiate condom use with clients when you move to a new place? **[nje oni ra fun yin lati beere lowo onibara yin lati lo roba idaabobo nigbati esese de ibi]** [Write the code for the response in the box]	Yes **[Beeni]** = **01** No **[Beeko]** = **02**	|____|____|	
Q714 csincome	What is your average income per week from sex work? **[elo lo n wole fun yin ni ise yi]** [Assist participant to calculate in Naira]	Monthly income (Naira) **[Owo osu(naira**]: |____|____|____|____|____|____|		
720 tc	Time Interview Completed **[Ipari iforowanilenuwo]** [Write in hours:minutes]	|_____|_____|:|_____|_____| HRS MINS		
730 intcom	The interview completed? **[Se iforowanilenuwo pari?]** [Write the code in the box, **"01" for YES and "02" for NO**]	Yes **[Beeni]** = **01** No **[Beeko]**= **02**		|____|____|